

9000020

EPA Region 5 Records Ctr.



228793

# FINAL REMOVAL DESIGN/REMOVAL ACTION WORKPLAN

## *REVISION 1*

### **MASTER METALS, INC. SITE**

*Cleveland, Ohio*



**PREPARED BY:**



**JANUARY, 2003**

**FINAL REMOVAL DESIGN/REMOVAL ACTION  
WORKPLAN**

**FOR  
THE MASTER METALS, INC. SITE  
CLEVELAND, OHIO**

**PREPARED BY  
ENTACT & Associates LLC.**

*January 2003*

**Remedial Design/Remedial Action Workplan  
Master Metals Site  
Cleveland, Ohio**

**TABLE OF CONTENTS**

<b><u>Section</u></b>	<b><u>Page</u></b>
<b>1.0 INTRODUCTION.....</b>	<b>1</b>
1.1 PURPOSE AND OBJECTIVES.....	1
1.2 SITE LOCATION AND DESCRIPTION .....	1
1.3 SITE HISTORY.....	2
1.3.1 MMI Facility.....	2
1.3.2 Holmden Avenue Properties .....	4
1.4 PREVIOUS REMOVAL ACTIONS.....	5
1.4.1 Phase I Time Critical Removal .....	5
1.4.2 Phase II Engineering Evaluation/Cost Analysis .....	5
1.5 ADMINISTRATIVE ORDER OF CONSENT .....	7
<b>2.0 PROJECT ORGANIZATION.....</b>	<b>10</b>
2.1 PROJECT ORGANIZATIONAL CHART .....	10
2.2 MANAGEMENT RESPONSIBILITIES.....	10
2.3 QUALITY ASSURANCE RESPONSIBILITIES.....	11
<b>3.0 SCOPE OF WORK TASKS .....</b>	<b>13</b>
3.1 INTRODUCTION AND OUTLINE OF TASKS.....	14
3.2 TASK 1 - WORK PLAN AND SUPPORTING PLANS .....	14
3.2.1 Performance Standard Verification Plan (PSVP) .....	14
3.2.2 Field Sampling and Analysis Plan (FSAP).....	14
3.2.3 Quality Assurance Project Plan (QAPP).....	14
3.2.4 Treatability Study Report (TSR).....	15
3.2.5 Erosion Control Plan (ECP).....	15
3.2.6 Community Relations Plan (CRP).....	15
3.2.7 Health and Safety Plan (HASP).....	15
3.2.8 Contingency Plan (CP) .....	15
3.3 TASK 2 - DESIGN PHASES .....	16
3.3.1 Construction Quality Assurance Project Plan (CQAPP) .....	16
3.3.2 Project Schedule.....	16
3.3.3 Truck Route .....	16
3.4 TASK 3 - REMEDIAL ACTION AND CONSTRUCTION.....	16
3.5 TASK 4 - OPERATIONS & MAINTENANCE.....	16
<b>4.0 REMEDIAL ACTION AND CONSTRUCTION .....</b>	<b>17</b>
4.1 PRECONSTRUCTION INSPECTION AND MEETING .....	17
4.2 MOBILIZATION AND SITE PREPARATION.....	18

**Final RD/RA Workplan  
Master Metals Site  
Cleveland, Ohio**

**TABLE OF CONTENTS continued**

<b><u>Section</u></b>	<b><u>Page</u></b>
4.2.1 Stormwater Control Measures .....	18
4.2.2 Staging and On-site Treatment .....	18
4.2.3 Air Monitoring .....	19
4.2.4 Dust Suppression/Engineering Controls .....	19
4.2.5 Subsurface Utilities and Other Obstructions.....	19
4.2.6 Site Security .....	20
4.2.7 Establishment of Coordinate Grid System.....	20
4.3 CLEARING OF SITE.....	20
4.4 DEMOLITION OF CONCRETE STRUCTURES.....	20
4.5 EXCAVATION, CONSOLIDATION AND TREATMENT .....	21
4.6 CONSTRUCTION OF ASPHALT COVER .....	22
4.7 REFURBISHMENT OF EXISTING CONCRETE SURFACE .....	22
4.8 MONITORING WELL ABANDONMENT .....	23
4.9 BACKFILLING AND SITE RESTORATION .....	23
4.10 TRANSPORTATION AND DISPOSAL OF EXCAVATED MATERIAL	24
4.11 CLEAN-UP AND DEMOBILIZATION.....	24
<b>5.0 WORK PRODUCTS .....</b>	<b>25</b>
5.1 DAILY, WEEKLY AND MONTHLY REPORTING .....	25
5.2 EMERGENCY NOTIFICATION .....	26
5.3 PHOTOGRAPHIC DOCUMENTATION.....	26
5.4 REMEDIAL ACTION SUBMITTALS.....	26
5.5 INSPECTION MEETINGS .....	26
5.6 FINAL INSPECTION AND RA REPORTS.....	27
<b>6.0 PROJECT SCHEDULE.....</b>	<b>28</b>
<b>7.0 REFERENCES.....</b>	<b>29</b>



## **List of Figures**

Figure 1-1	Site Location Map
Figure 1-2	Site Features
Figure 1-3	Phase I Grid Excavations and Phase II EE/CA Soil Sampling Locations
Figure 2-1	Project Organizational Chart
Figure 3-1	Deliverable Schedule
Figure 6-1	Project Schedule

## **List of Appendices**

Appendix A	Statement of Work (SOW) and USEPA Letter Revisions to SOW
Appendix B	Performance Standard Verification Plan
Appendix C	Field Sampling and Analysis Plan
Appendix D	Quality Assurance Project Plan
Appendix E	Treatability Study Report
Appendix F	Erosion Control Plan
Appendix G	Community Relations Plan

Health and Safety Plan and Contingency Plan– Attachment under Separate Cover

---

## LIST OF ACRONYMS/ABBREVIATIONS

ARARs	Applicable or Relevant and Appropriate Requirements
AOC	Administrative Order by Consent
ASTM	American Standards for Testing Materials
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQAPP	Construction Quality Assurance Project Plan
COC	Chain of Custody
CLP	Contract Laboratory Program
DQO	Data Quality Objective
EE/CA	Engineering Evaluation and Cost Analysis
ENTACT	ENTACT & Associates LLC
FINDS	Facility Index System
FSAP	Field Sampling and Analysis Plan
LDR	Land Disposal Restriction
mg/Kg	Milligrams /Kilogram
mg/L	Milligrams/Liter
MMI	Master Metals, Inc
NAAQS	National Ambient Air Quality Standard
NCP	National Contingency Plan
NEORS	Northeast Ohio Regional Sewer District
O&M	Operation and Maintenance
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
PCBs	Polychlorinated Biphenyls
ppm	Parts Per Million
PRP	Potentially Responsible Parties
QA/QC	Quality Assurance/ Quality Control
QAPP	Quality Assurance Project Plan
RBRG	Risk-Based Remediation Goal
RCRA	Resource Conservation and Recovery Act
RD/RA	Removal Design/ Removal Action
RPM	Remedial Project Manager
SACM	Superfund Accelerated Cleanup Model
SARA	Superfund Amendments and Reauthorization Act
SOP	Standard Operating Procedure
SOW	Statement of Work
SWMU	Solid Waste Management Unit
TAT	Technical Assistance Team
TCR	Time Critical Removal
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total Petroleum Hydrocarbon
TSP	Total Suspended Particulate
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
XRF	X-Ray Fluorescence

## 1.0 INTRODUCTION

### 1.1 PURPOSE AND OBJECTIVES

This document has been prepared by ENTACT & Associates LLC (ENTACT) in accordance with the objectives set forth in the September 22, 2000 Action Memorandum and the September 25, 2002 Administrative Order on Consent (AOC) and Statement of Work (SOW) for the Master Metal Inc. (MMI) Site in Cleveland, Ohio. On September 22, 2000, the United States Environmental Protection Agency (USEPA) signed a modified remedy Action Memorandum, which changed the project scope to accommodate the Prospective Purchaser's planned redevelopment of the MMI facility. ENTACT has developed this Removal Design (RD) and Removal Action (RA) Workplan to outline the procedures and methodologies to be used for the remedial action at the Master Metals Site. The objective of this RD/RA Workplan is to provide for the safe and efficient completion of the removal action pursuant to the Comprehensive Environmental Reponse, Compensation, and Liability Act of 1980, 42 USC §9601 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986, Pub. L No. 99-499, 100 Stat. 1613 (1986) (SARA).

This RD/RA Workplan includes a comprehensive description of the work to be performed, and a schedule for both the completion of each major activity and submission of each deliverable. This plan consists of six sections, summarized below:

- **Section 1: Introduction** – Section 1 provides a description of the Site, including the location and history.
- **Section 2: Project Organization and Management** – Section 2 provides a description of the project team, project organization, and responsibilities.
- **Section 3: Scope of Work Tasks** – Section 3 includes a description of the main three primary SOW tasks, including project plans, RD phases, and RA construction.
- **Section 4: Removal Action and Construction** – Section 4 describes the major construction activities that will be implemented during the RA pursuant to the September 25, 2002 AOC and the SOW.
- **Section 5: Work Products and Reports** – Section 5 describes and lists the reporting requirements during the implementation and at the completion of the RA.
- **Section 6: Project Schedule** – Section 6 presents the project schedule which includes a schedule of completion for each required major activity and submission of each major deliverable.

### 1.2 SITE LOCATION AND DESCRIPTION

The MMI Superfund Site (the "Site") covered under the September 25, 2002 AOC includes the former MMI lead facility (the "Facility") located at 2850 West Third Street, Cleveland, Cuyahoga County, Ohio and stockpiled, treated soils removed from the residential property at 1157, 1159 and 1167 Holmden Avenue (the "Holmden Properties") where lead-impacted material from Master Metals was deposited as fill (USEPA, 1999). The Site is situated in Township 7 North, Range 12 West, Section 17, ¼ NE, ¼ SW, ¼ SW, with coordinates obtained from the Facility Index System (FINDS) listed as 41 degrees, 28 minutes, 26 seconds latitude and -81 degrees, 40 minutes, 31 seconds longitude. The site location is illustrated in Figure 1-1.

The MMI property is a triangular-shaped parcel encompassing approximately 4.3 acres in the "flats" area of downtown Cleveland, a heavily industrialized sector of the city. The site is bordered on west by rail yards owned by the Baltimore & Ohio (B&O) Railroad, the east by West Third Street and B&O railroad tracks, and on the south by a dead-end road and an abandoned industrial property. LTV Steel owns the property to the south and north. The Cuyahoga River is located approximately 1,250 feet east of the facility and flows north toward Lake Erie (ENTACT, 1999). An athletic field and playground are situated approximately 1,000 feet to the west. The nearest residential property to the former facility is approximately 2,000 feet to the northwest (USEPA, 1999).

Major site features, prior to a 1997-1998 time-critical removal (TCR) action, included an office building, a secondary lead smelting furnace building, two large brick baghouses, the roundhouse building, storage buildings, material storage bins and boxes, and an above-ground storage tank farm (ENTACT, 1998). All buildings were razed as part of the Phase I TCR (ENTACT, 1998) with the exception of the former office building which is attached to the roundhouse. The roundhouse is not part of the Master Metals Site. All remaining feedstock and debris materials were decontaminated and/or treated and disposed of off-site as either special waste or as hazardous waste (ENTACT, 1998). The MMI facility property is currently vacant. A portion of the roundhouse that is not a part of the Master Metals Site is occupied by the railroad preservation society, and the majority of the open land surface is covered with concrete or asphalt except along the site boundaries. Current site features are illustrated in Figure 1-2.

Stormwater drainage is directed toward one of five on-site stormwater catch basins that connect to the combined sewer system operated by the Northeast Ohio Regional Sewer District (NEORSDD) (ESC, 1991).

Topographic maps suggest that the direction of groundwater flow and surface water flow in the vicinity of MMI is to the northeast toward the Cuyahoga River (ENTACT, 1999).

## **1.3 SITE HISTORY**

### **1.3.1 MMI Facility**

The facility was constructed in 1932 on slag fill by National Lead Industries, Inc. (NL Industries) who owned and operated the facility as a secondary lead smelter, producing lead alloys from lead-bearing dross and scrap materials. NL Industries also engaged in battery cracking operations at this facility. In 1979, the facility was purchased from NL Industries by MMI who continued to run secondary lead smelter operations (USEPA, 2002).

As part of their operations, the MMI facility received lead-bearing materials classified and regulated under Resource Conservation and Recovery Act (RCRA) as D008 hazardous waste from off-site sources (USEPA, 2002). This waste was converted into lead ingots using pot and rotary furnaces equipped with baghouses to collect particulate matter from the furnace that consisted predominantly of lead dust. The material that accumulated in the furnaces/baghouses after smelting was classified as K069 hazardous waste. Finished lead ingots were stored in a roundhouse at the north end of the property prior to shipment off-site.

Based on background information, the by-products produced from smelting operations included furnace flux, slag, dross, baghouse fines and furnace sludge (USEPA, 2002). With the exception

of slag, which was tested and disposed of off-site, most of the lead-bearing by-products were recycled back into the furnace. Cooling water used in the operations was diverted to a combined sewer system operated by the NEORS (ESC, 1991).

On November 19, 1980, Master Metals filed a "Part A Permit" pursuant to the newly-promulgated RCRA regulations, and obtained "interim status" under RCRA to operate specific waste piles and treatment units, as well as a container-based storage area for the hazardous lead-bearing materials. On January 11, 1982, Master Metals filed for Chapter 11 bankruptcy through the U.S. Bankruptcy Court for the Northern District of Ohio but subsequently went into reorganization and operations at the facility continued. Though Master Metals had submitted a Part B RCRA permit application prior to November 8, 1985, on that date the facility lost interim status for the hazardous lead-bearing waste piles at the facility for failure to comply with financial requirements of 40 CFR Part 265, Subpart H.

On June 15, 1987, a complaint of RCRA violations was filed by the United States, seeking closure of the D008 and K069 waste piles at the facility. In response to this action, MMI presented a partial closure plan that included procedures to close these waste piles (USEPA, 2002). Soil and groundwater sampling was conducted by MMI as part of this closure plan. Analytical data from the soils showed lead and cadmium present in the soils at concentrations below the then-applicable Environmental Profile (EP) toxicity criteria. Groundwater samples collected approximately ten feet below ground surface showed the presence of relatively low levels of lead and cadmium at levels just above the Ohio groundwater standards (ESC, 1991).

On January 15, 1990, Master Metals entered into Consent Decree with the United States to resolve RCRA continuing violations. In April 1990, MMI submitted to the USEPA a revised RCRA Part B Permit application for closure of various solid waste management units (SWMUs) on the facility (USEPA, 2002).

Violations relating to noncompliance and poor operating practices are documented in various state and federal agency reports. These findings are summarized in the Section III of the AOC, presented in Appendix A. In January of 1992, the Ohio Environmental Protection Agency (OEPA) installed three ambient air monitors near the facility property. Quarterly air sampling results from the station immediately downwind of the facility showed repeated exceedences of the Clean Air Act's 42 USC National Ambient Air Quality Standard (NAAQ) for lead. MMI installed a sprinkling system in July 1992 in an attempt to prevent air-borne migration of the dust from the facility (USEPA, 2002) but exceedences of the NAAQ for lead continued to be measured downwind of the facility. On September 9, 1992, MMI conducted a thorough cleaning of the facility in another attempt to minimize the effects of wind-blown facility dust.

On August 5, 1993, as a result of continuing RCRA violations, the OEPA Director ordered MMI to cease operating the facility until it could demonstrate compliance (USEPA, 2002). Operations never did resume at the MMI facility and Bank One of Ohio took possession of all MMI cash collateral and accounts receivable. The former facility president, Mr. Douglas Mickey, is deceased (USEPA, 2002). The current property owner is Bredt-Zanick L.L.C. who planned on redeveloping the property for industrial use following the removal action.

Following shutdown, MMI and the USEPA continued negotiations to resolve RCRA noncompliance issues. On March 28, 1995 the USEPA RCRA Division deferred the MMI Site to CERCLA for cleanup. On August 22, 1995, MMI withdrew all permits still in effect regarding



its operation terminating its ability to legally treat, store or dispose of hazardous waste at the facility (USEPA, 2002). Fifty-three potentially responsible parties (PRP Respondent Group) signed an Administrative Order by Consent (AOC) for the MMI facility that became effective April 17, 1997. The Order required the PRPs to conduct a Phase I TCR action and a Phase II Engineering Evaluation and Cost Analysis (EE/CA) for a non-time critical removal action for the facility pursuant to the National Contingency Plan (NCP) and the Superfund Accelerated Cleanup Model (SACM) guidance.

In accordance with the April 17, 1997 AOC Docket No: V-W-97-C both the Phase I TCR and Phase II EE/CA were completed by ENTACT on behalf of the PRP Respondent Group, as described in Section 1.4 of this Workplan.

An environmental evaluation of potential impacts associated with implementation of an excavation remedy was performed as part of the Proposed Plan (USEPA, 1999). The evaluation determined that most of the adverse effects associated with excavating soils would be short-term in nature and could be controlled by using good construction practices.

### **1.3.2 Holmden Properties**

The Holmden Properties encompass approximately one-half of an acre and are located in a residential neighborhood, atop a hillside overlooking the flats. They are surrounded on the north, east and west by continuing residential areas and on the south and southeast by industrial areas located at the bottom of the hillside (USEPA, 2002). In the late summer of 1987, lead-bearing material from MMI facility was allegedly deposited at the Holmden Properties as fill.

In 1991, the occupants of 1157 Holmden Avenue at the Holmden Properties contacted the OEPA to relate their concerns with the Master Metals fill material. In response, the OEPA collected soil samples at the Holmden Properties and found elevated concentrations of lead and cadmium. Based on the analytical results, OEPA required MMI to remove contaminated soils from the Holmden Properties. Following removal, the OEPA conducted a second soil sampling investigation in March, 1992 on the Holmden Properties and found additional lead-impacted soils. In December 1992, MMI removed additional soils from the Holmden Properties and conducted soil sampling following removal. The analytical results showed elevated levels of lead remained in the soils. The occupants of 1157 Holmden not able to return to their home, which was vandalized and later damaged by arson. The City of Cleveland condemned the house on August 18, 1995 and demolished it on February 22, 1996. Beginning on April 9, 1997, Ecology & Environment Technical Assistance Team (TAT) conducted an additional site investigation at the Holmden Properties and the results indicated between 2,000 to 3,000 cubic yards of lead-impacted material exceeding the 400 mg/kg default residential cleanup criteria was present.

On October 23, 1997, six potentially responsible parties (PRPs) signed an AOC for the Holmden Properties agreeing to conduct a TCR pursuant to the National Contingency Plan (NCP) and Superfund Accelerated Cleanup Model (SACM) guidance. On behalf of the Holmden Respondents, ENTACT conducted a time-critical removal action between November 10, 1997 and December 6, 1997 to remove contaminated soils exceeding a residential cleanup level of 400 mg/Kg along Holmden Avenue (ENTACT, 1998c). The excavated contaminated soils were stabilized to below a Toxicity Characteristic Leaching Procedure (TCLP) level of 0.75 mg/L, well below the Land Disposal Restriction (LDR) criteria, then stockpiled on the facility property for

ultimate disposal (ENTACT, 1998c). Following excavation and confirmatory sampling to verify that the cleanup objective of 400 mg/Kg had been met, the Holmden Properties were restored to their original condition including revegetation (ENTACT, 1998c).

## **1.4 PREVIOUS REMOVAL ACTIONS**

### **1.4.1 Phase I Time Critical Removal Action**

The Phase I TCR was conducted by ENTACT on behalf of the PRP Respondent Group between June 9, 1997 through January 6, 1998 in accordance with the AOC Docket No: V-W-97-C. The TCR included the excavation, demolition, consolidation and/or removal of highly contaminated buildings, structures, soils, loose waste materials, industrial debris and other equipment to reduce the spread of, or direct contact with, documented contamination. This included the characterization and removal of non-hazardous materials, and removal, treatment, as necessary, and disposal of hazardous materials. The complete results of the TCR investigation are detailed in the Time Critical Removal Action Phase I Final Report, dated April 24, 1998 (ENTACT, 1998a).

Decontamination and/or demolition of the existing structures were conducted as part of the Phase I TCR scope of work. All materials deemed non-hazardous or recyclable were decontaminated prior to leaving the site. With the exception of the office building, all site structures were razed in accordance with the AOC.

All on-site surface areas not covered with concrete were excavated to a maximum depth of two feet or until historic slag fill materials (i.e., slag, cinders, etc.) were encountered. Lead concentrations in the remaining historic slag fill material were documented up to 39,000 parts per million (ppm) (ENTACT, 1998a). The excavated soils were stabilized to render the material nonhazardous and transported off-site to an approved Subtitle D landfill. Approximately 4,300 tons of treated soils were removed as part of this action (ENTACT, 1998a). Following excavation, the excavated areas were backfilled with clean fill material in accordance to the approved Phase I TCR Workplan.

As part of the Phase I TCR, approximately 4,800 cubic yards (yd<sup>3</sup>) of solid non-hazardous waste, 500 y<sup>3</sup> of brick/concrete special waste, 21 tons of asbestos-containing materials, 1,160 y<sup>3</sup> of K069, D006, and D008 hazardous waste, 3,600 pounds (lbs.) of chromium trioxide, and over 200 bottles of laboratory chemicals were removed from the facility and properly disposed of in accordance with applicable state and federal guidelines. Approximately 3,000 gallons of liquid waste associated with drummed liquids in the roundhouse, six above-ground storage tanks and below grade sumps and catch basins were collected, characterized and disposed of off-site (ENTACT, 1998a). The site was also secured with fencing and signs to prevent unauthorized entry (ENTACT, 1998a).

### **1.4.2 Phase II Engineering Evaluation and Cost Analysis**

The Phase II EE/CA was conducted by ENTACT on behalf of the PRP Respondent Group to develop an appropriate cleanup objective or Risk-Based Remediation Goal (RBRG) for the residual concentrations of lead remaining in soils at the MMI Site (ENTACT, 1998b). In accordance to AOC Section V.2, the EE/CA included the following five tasks:

1. Generation of EE/CA Workplan;

2. Generation of EE/CA Support Sampling Plan;
3. Completion of Support Sampling;
4. Generation of the EE/CA Data Report; and
5. Generation of the EE/CA Report.

Complete results of the EE/CA investigation are included in the EE/CA Report dated November 23, 1998 (ENTACT, 1998b).

Historical analytical data collected at the site between 1990 and 1998 were evaluated to determine the nature and extent of contamination at the site related to former site activities, and to identify where additional investigation was required to complete delineation of the facility-associated impacts. The historic slag fill, which pre-dates and underlies the facility as well the majority of the surrounding area, contains elevated lead concentrations that are not related to former facility operations and therefore, not included in the removal actions for this site. Based on this review, additional soil and groundwater sampling were conducted to complete characterization of the nature and extent of lead contamination related to former facility operations. The EE/CA characterization investigation included on-site and off-site soil sampling, a perimeter XRF lead survey on surface soils, and groundwater sampling.

The on-site soil sampling included the advancement of seven borings within the facility perimeter. Results indicated that five of the seven borings exceeded 1,500 mg/Kg lead at total depth. Historic slag was encountered at approximately three to four feet which is consistent with the information collected during the Phase I TCR (ENTACT, 1998b). The on-site sampling indicated that significant lead concentrations, up to 35,000 mg/Kg, remained in on-site soils to a depth of three to four feet below grade. These areas were either covered with the existing concrete surface or had been excavated and backfilled with two feet of clean fill as part of the Phase I TCR. Therefore in areas where the concrete was competent and in uncovered areas that were excavated as part of the Phase I TCR, the potential for further entrainment of airborne lead had been mitigated and was no longer considered a concern (ENTACT, 1998b). However a potential for airborne lead releases did exist in areas where the concrete was compromised. These areas were recommended for repair to mitigate this airborne migration route (ENTACT, 1998b).

A perimeter surface soil survey was conducted adjacent to the fence line along the western, eastern and southern boundaries of the MMI facility property using an X-Ray Fluorescence (XRF) instrument, at nineteen locations designated in Figure 1-3. Results of the perimeter lead survey showed lead levels ranging from 931 ppm to 36,587 ppm within the upper 12 to 24 inches of soils, decreasing rapidly with depth. The surficial elevated lead levels currently pose a potential ingestion or inhalation threat, and were recommended for further remedial action (ENTACT, 1998b).

Off-site sampling included the collection of nine off-site surface soil samples along Quigley Avenue. The results showed the average lead concentration to be below the Superfund residential soil screening level of 400 mg/Kg, indicating that any potential airborne lead impacts from the former MMI facility are minimal. No further action was recommended (ENTACT, 1998b).

Groundwater sampling conducted in 1991 showed total lead concentrations ranging from 0.45 mg/L to 1.35 mg/L, total chromium concentrations ranging from 0.02 mg/L to 1.33 mg/L, and lesser concentrations of arsenic and cadmium (CTI, 1991). Groundwater sampling of the three existing monitoring wells during the 1998 EE/CA investigation showed the presence of lead, arsenic, cadmium and chromium at levels that have either remained at, or have declined from, the

1991 sampling results. Groundwater is not used as a source of drinking water within a four-mile radius of the site, with Lake Erie supplying the greater Cleveland area with its drinking water supply. Based on the low concentrations of metals in the groundwater and the lack of any potential downgradient receptors, the groundwater migration pathway was eliminated as a current concern (ENTACT, 1998b). The Master Metals site lies within the "Industrial Valley Area" (ID98USD013) Urban Setting Designation (USD) that the City of Cleveland requested and obtained from Ohio EPA's Voluntary Action Program, pursuant to Ohio Administrative Code 3745-300-10(D). The USD is based on the urban nature of the area, the availability and widespread use of public drinking water supplies and the lack of use of the groundwater in the area for drinking purposes.

The EE/CA assessment verified that lead was the predominant hazardous constituent of concern at the site, with lesser occurrences of arsenic. Removal action directed at lead exceedences would also address the co-located elevated levels of arsenic. Based on a streamlined risk evaluation, a RBRG for lead of 1,000 mg/Kg was established for on-site and off-property perimeter soils (ENTACT, 1998b).

An environmental evaluation of potential impacts associated with implementation of an excavation remedy was performed as part of the Proposed Plan (USEPA, 1999). The evaluation determined that most of the adverse effects associated with excavating soils would be short-term in nature and could be controlled by using good construction practices to control fugitive dust emissions and minimize contaminated surface water runoff.

## **1.5 ADMINISTRATIVE ORDER OF CONSENT**

Based on the findings of the Phase II EE/CA, an Action Memorandum was signed by the USEPA on September 22, 2000 and an Administrative Order of Consent (AOC) was entered into between the USEPA and the PRP Respondent Group on September 25, 2002 to perform a non-critical removal action, as described in the Statement of Work (SOW) to address remaining lead impacts at the site that are associated with former facility operations. The September 25, 2002 AOC is presented in Appendix A. The following activities will be undertaken per the SOW:

- Clear and grub areas requiring excavation of all trees and brush for disposal off-site.
- Demolish applicable above-grade concrete and metal structures remaining on-site after the Phase I TCR demolition activities as detailed in the design specifications. Sized concrete construction debris will either be used as a sub-base material in unpaved areas to be covered with the asphalt cover or will be transported off-site disposal as construction debris. In all areas off the concrete pad, the asphalt cover shall be underlain by a base course layer adequate to support the industrial traffic. The specification of the base course shall be consistent with the standards listed in Section 400 of ODOT's Pavement Design and Rehabilitation Manual in accordance with the Final Design Documents. All wood, bricks or metal debris that are removed will be disposed of off-site as construction debris.
- Establish a coordinate grid system using global positioning software (GPS) or similar along the perimeter of the property outside the fence line and in on-site areas where excavation is required.

- Excavate off-property soils along the western, eastern and southern perimeter of the MMI facility, that exceed the RBRG of 1,000 mg/Kg or until historic slag fill material is encountered, whichever comes first. XRF screening technology will be used to guide the depth of the excavations during removal with confirmational laboratory analysis.
- Excavate designated on-site soils that are not under concrete or the proposed asphalt cover (including grids I1, J1 and K1 excavated during the Phase I TCR) that exceed the RBRG of 1,000 mg/Kg or until historic slag fill material is encountered, whichever comes first.
- Conduct laboratory confirmatory soil sampling from the excavation floor in grids where the excavation was terminated prior to reaching the historic slag fill material to confirm that all soils (other than historic slag) that are above the cleanup level have been excavated and removed.
- Backfill all excavated areas once verified to have met the RBRG or have reached historic slag fill, and grading to promote positive drainage in accordance with the design documents. Backfill for areas not covered by asphalt or concrete will be filled with clean imported fill material confirmed with confirmational laboratory analysis that has been approved for use based on analytical results and is suitable to maintain vegetative growth.
- Stabilize excavated soils to meet the applicable LDRs for contaminated soils for lead, and any underlying hazardous constituent (UHC) during waste profiling, to render the material nonhazardous for either use as fill in low areas beneath the proposed asphalt cover or for off-site disposal at an approved Subtitle D facility.
- Conduct laboratory verification sampling of treated soils using TCLP lead analysis to verify the material has been rendered non-hazardous for lead prior to either placement in low areas beneath the proposed asphalt cover or for off-site disposal as nonhazardous waste.
- Off-site disposal of all treated soils not placed beneath the proposed asphalt cover, in accordance with the SOW and the approved design plan.
- Place an asphalt cover over the deteriorated area of the concrete and non-concrete areas located in southern portion of the site in accordance with the design documents. The base course under the asphalt in the non-concrete areas (pits and brick road) will conform to ODOT specifications for pavement design and rehabilitation presented in the Final Design Documents.
- Recondition existing concrete surfaces not under the asphalt cover by sealing any significant cracks and breaks that extend through the concrete surface, followed by encapsulation of the concrete surface, in accordance with the approved design plan. Significant cracks are defined as fully penetrating the concrete surface with a width greater than 1/2 inch.
- Abandon of all existing monitoring wells on site in accordance to applicable State of Ohio regulations (OAC-3745-9-10 ).
- Remove any existing solid waste including Investigative Derived Waste (IDW) from previous or current removal actions.
- Install a 6-foot high perimeter chain-link fence and three double-swing gates at the



completion of the RA to control site access at the site in accordance with the design documents.

- Development of an Operation and Maintenance (O&M) Plan to ensure the integrity of the remedy by maintaining and repairing the concrete and asphalt cover, and the perimeter fencing for a period of thirty (30) years, and as specified in the AOC.

---

## 2.0 PROJECT ORGANIZATION AND MANAGEMENT

Project organization, responsibilities, lines of communication, and reporting procedures are described in the following sections.

### 2.1 PROJECT ORGANIZATIONAL CHART

Figure 2-1 illustrates the lines of authority of the Project Management Team for overseeing and implementing the required remedial action (RA) at the MMI Site in Cleveland, Ohio. ENTACT's assigned management team may change during implementation of the RA. If there is a change in personnel of ENTACT's management team, the modification will be communicated to US EPA's RPM and the Project Coordinator. Qualifications and experience of ENTACT's Management Team is provided in Appendix D, Quality Assurance Project Plan, in Attachment QAPP-D.

### 2.2 MANAGEMENT RESPONSIBILITIES

#### **USEPA CERCLA Remedial Project Manager, Gwen Massenburg**

The USEPA CERCLA Remedial Project Manager has the overall responsibility for all phases of the Remedial Action Workplan.

#### **Project Coordinator, Terry Casey, Efficasey Environmental LLC.**

The Project Coordinator's prime responsibility will be to ensure proper coordination among various project stockholders. These stakeholders include the USEPA, OEPA, City of Cleveland, NOLTCO, Bredt & Zanick, LLC, the Project Manager, and the Respondents to the Order.

#### **ENTACT Project Manager, Rich Wood, ENTACT**

The ENTACT Project manager will be responsible for ensuring that the site activities are implemented and completed in accordance with the AOC, SOW, the U.S. EPA-approved RD/RAA Workplan and federal, state, and local regulations. He will be responsible for the following tasks:

- Providing personnel and equipment for remedial activities;
- Provide the Project Coordinator and U.S. EPA's RPM the names and qualifications, if appropriate, of the contracted laboratory, disposal facilities, and transporters used to implement the RA;
- Ensuring that ENTACT's associates perform their designated duties in strict accordance with the Health and Safety Plan;
- Ensuring required quality assurance/quality control (QA/QC) procedures are properly implemented and documented;
- Notifying appropriate personnel identified in the Health and Safety Plan (HASP) in the event that the Contingency Plan is implemented;
- Ensuring the RA is completed consistent with the approved schedule;
- Facilitating effective communications between the Project Coordinator and U.S. EPA's RPM;
- Ensure that all documents and reports that ENTACT is required to generate meet the requirements of the approved workplan;

- Communicate any request for modifications to the approved workplan to the Project Coordinator and U.S. EPA; and,
- Promptly notifying the Project Coordinator and U.S. EPA's RPM in the event of unforeseen field conditions and/or problems are encountered.

**Corporate Health and Safety Officer, Don Self, ENTACT & Associates LLC**

The Corporate Health and Safety Officer will coordinate and provide oversight for the Health and safety issues at the site. He will be responsible for conducting the Health and Safety Orientation Meeting before the RA is implemented. He will review weekly health and safety updates from the site and conduct several inspections at the site during the RA.

**Regulatory/Technical Leads, Pat Vojack P.G., ENTACT & Associates LLC**

Ms. Vojack will provide regulatory and technical support to the Project Manager in ensuring that the site activities are implemented and completed in accordance with the AOC, SOW, the U.S. EPA-approved RA Workplan and federal, state, and local regulations. Ms Vojack will ensure that the construction activities conform to the approved design documents. The regulatory and technical lead will provide technical support to the ENTACT Project Manager in the areas of wastewater management and treatment, solid and hazardous waste management, air monitoring, and any other technical design requirements for the RA.

***Management Control Process***

The Project Coordinator has responsibility for successfully implementing the requirements of the AOC. The ENTACT Project Manager has overall responsibility for successfully completing the remedial action at the site. This includes safely completing technical Statement of Work items, fulfilling contractual obligations, compliance with the approved workplan, and meeting or exceeding the established project schedule and budget. The Project Manager will accomplish these objectives by monitoring the work progress, reviewing and planning each project task with experienced technical staff and the Field Project Manager, and ensuring the appropriate and sufficient resources are available to the Field Project Manager and the On-Site QA/QC Officer.

The Project Manager will receive daily progress reports from site personnel appraising him of the status of planned, ongoing, and completed work, including QA/QC performance and health and safety, site-specific issues. In addition, the Project Manager will be apprised of any potential problems and recommendations for solutions and/or corrective action.

## **2.3 QUALITY ASSURANCE RESPONSIBILITIES**

**US EPA Region 5 Superfund's Quality Assurance Reviewer, Richard Byvik**

U.S. EPA Superfund Quality Assurance Coordinator has the responsibility to review and approve all Quality Assurance Project Plans. In addition, the U.S. EPA Quality Assurance Coordinator is responsible for conducting external performance and system audits of the laboratory and evaluating analytical field and laboratory procedures.

**ENTACT Quality Assurance/Quality Control Manager, Patricia Vojack, P.G., ENTACT & Associates LLC**

Ms. Vojack will be responsible for setting up the QA Program for this site and ensuring that all approved QA/QC procedures for this project are being followed. In addition, the ENTACT QA/QC Manager will be responsible for ensuring that data validation is completed for 25 percent of the sample results from the analytical laboratory by an outside Chemist.

**On-Site QC Officer, ENTACT, Inc.**

The on-site Quality Control Officers will be responsible for performing required quality control testing at the site. The on-site QC officer will operate independently of ENTACT's Project Manager and Field Project Manager. The QC Officer will communicate any QA/QC issues related to the site to the QA/QC Manager. The QC officer will have the authority to correct and implement additional measures to assure compliance with the approved workplan, including the QAPP. Specific responsibilities will include:

- Adhere to the approved QAPP;
- Document any deviations to the plan with a justification for the deviations, and if necessary appropriate notification in accordance with the approved workplan;
- Secure necessary sampling tools, bottles, packaging/shipping supplies, chain-of custody documents, etc. in accordance with the approved workplan;
- Collect or direct the collection and ship samples at the frequencies and for laboratory analysis parameters specified in the QAPP;
- Document the location, time, and date of all samples that are collected and shipped to the laboratory;
- Interface with the superintendents such that the sample collection is coordinated with the general progression of the work;
- Notify the Project Manager, and the U.S. EPA of any sampling activities associated with the implementation of the approved workplan; and
- Obtain analytical results and report the data to the Project Manager and U.S. EPA's RPM.

### **3.0 SCOPE OF WORK TASKS**

#### **3.1 INTRODUCTION AND OUTLINE OF TASKS**

In order to expedite the Removal Action and facilitate redevelopment of the property, the seven tasks outlined in Section 3 of the SOW have been consolidated into four tasks as described below. The requirements listed in the SOW as Task 1 (Removal Design Workplan), Task 3 (Removal Action Workplan), Task 4 (Workplan Addendum) and Task 7 (Performance Monitoring) in the SOW have been combined into a single task, Task 1, Development of Draft and Final RD/RA Workplan. The Removal Design Phases outlined in Task 2 have been streamlined into the submittal of Task 2, Pre-Final Design and Final Design Document. The consolidation of the submittals proceeded with approval from the USEPA, in accordance to Section III of the SOW.

The required schedule for these submittals is presented in Figure 3-1. The consolidated tasks are as follows:

**Task 1: Development of the RD/RA Workplan, including the following, required supporting plans:**

- Performance Standard Verification Plan
- Field Sampling and Analysis Plan
- Quality Assurance Project Plan
- Contingency Plan
- Treatability Study Report
- Erosion Control Plan
- Community Relations Plan
- Health and Safety Plan and Contingency Plan (Separate Attachment)

**Task 2: Development of the pre-final and final design documents for the RD/RA Workplan**

- Pre-final Design document which includes the draft Construction Specifications with all associated drawings, and the Construction Quality Assurance Project Plan (CQAPP) for the implementation of the RA.
- Final Design that includes the final Construction Specifications and CQAPP, construction estimates, and construction schedule for the implementation of the RA.

**Task 3: Implementation of Removal Action Construction**

- Pre-construction inspection meeting
- Mobilization
- Storm water control measures
- Treatment staging area and on-site treatment containment area construction
- Air monitoring
- Dust suppression/engineering controls
- Clearance of subsurface utilities and other obstructions
- Site security
- Establishment of grid coordinate system
- Demolition of existing above-grade concrete and metal structures in footprint of asphalt cover



system

- Clearing of trees
- Soil excavation, stockpiling and treatment
- Post-excavation confirmatory soil sampling
- Backfilling and site restoration
- Off-site disposal of treated material
- Transportation and disposal
- Cleanup and demobilization
- Pre-final Inspection Meeting and Report
- Final Inspection Meeting
- Completion of Removal Action Report
- Completion of Work Report

#### **Task 4: Operation and maintenance**

### **3.2 TASK 1 – WORKPLAN AND SUPPORTING PLANS**

Task 1 consists of the preparation of the RD/RA Workplan and supporting plans for submittal to the U.S. EPA. The following sections describe the contents of each of the supporting plans, which includes the Performance Standard Verification Plan (PSVP), Field Sampling and Analysis Plan (FSAP), Quality Assurance Project Plan (QAPP), Treatability Study Report (TSR), Erosion Control Plan (ECP), Community Relations Plan (CRP), and the Health and Safety Plan (HASP) and Contingency Plan (CP).

#### **3.2.1 Performance Standard Verification Plan (PSVP)**

The PSVP summarizes all performance standards to be met during and after the RA. The PSVP includes, among other criteria, the methodologies for treatment and for conducting TCLP testing. The FSAP, HASP, and the QAPP support the PSVP.

The PSVP is presented in Appendix B of this RD/RA Workplan.

#### **3.2.2 Field Sampling and Analysis Plan (FSAP)**

The FSAP supplements the QAPP and addresses sample collection activities, including confirmatory soil sampling, XRF screening, sampling for treatment and disposal, and air sampling.

The FSAP is presented in Appendix C of this RD/RA Workplan.

#### **3.2.3 Quality Assurance Project Plan (QAPP)**

The Quality Assurance Project Plan (QAPP) is a site-specific plan for sample analysis and data handling. It includes a description of sample custody control, field and laboratory quality control checks, and corrective actions.

The QAPP is presented in Appendix D of this RD/RA Workplan.

### **3.2.4 Treatability Study Report (TSR)**

The TSR presents the results of the laboratory treatment studies ENTACT has conducted on lead-impacted material obtained from the site. The treatability study for site soils was performed in 1997 as part of the Phase I activities. The purpose of the study was to determine the on-site treatability of representative soils. The plan also includes a brief discussion of ENTACT's patented treatment system and patented treatment additives that would be used in the on-site treatment process.

The TSR is presented in Appendix E of this RD/RA Workplan.

### **3.2.5 Erosion Control Plan (ECP)**

The ECP contains a description of the remedial construction site conditions, hazardous materials and handling, erosion controls, and best management practices that will be implemented to minimize the potential for contaminated run-off from the site. The plan meets the substantive requirements of OEPA's erosion and sediment control requirements for construction activities.

The ECP is presented in Appendix F of this RD/RA Workplan.

### **3.2.6 Community Relations Plan (CRP)**

The CRP describes the methods that will be used to inform the surrounding community of the planned remedial activities at the site. In addition, the CRP identifies an easily accessible repository for information about the remedial actions to be implemented at the site.

The CRP is presented in Appendix G of this RD/RA Workplan.

### **3.2.7 Health and Safety Plan (HASP)**

The site-specific HASP describes all procedures and criteria to protect on-site personnel and area residents from physical, chemical, and all other hazards potentially posed during the implementation of the RA. The HASP includes detailed descriptions of levels of protection, personal protective equipment, decontamination procedures, and contingency procedures.

The HASP is presented under separate cover and accompanies this RD/RA Workplan.

### **3.2.8 Contingency Plan (CP)**

The CP describes procedures to be used in the event of an accident or emergency at the MMI Site, including corrective action measures that will be taken if there is an exceedence of performance standards required for air at or from the site. The plan also includes a brief discussion of the process to be followed if an emergency or accident occurs at the site during the RA. Responses to emergencies or accidents are described in more detail in the site-specific Health and Safety Plan.

The CP is included with the HASP (under separate cover) and accompanies this RD/RA Workplan.

### **3.3 TASK 2 – DESIGN PHASES**

Task 2 of the SOW includes the Pre-final and Final Design documents, the Draft/Final CQAPP, construction estimates, the planned trucking route, and the final project schedule for the construction and implementation of the RA. The Pre-Final Design represents a 95 percent complete design, including reproducible drawings and specifications suitable to implement the RA. Upon the U.S. EPA's approval of Final Design construction estimates, final CQAPP, and final Project Schedule, the Pre-Final Design will serve as the Final Design. The Pre-Final Design submittals include the draft CQAPP, the truck route and the draft Project Schedule.

#### **3.3.1 Construction Quality Assurance Project Plan (CQAPP)**

The Construction Quality Assurance Project Plan (CQAPP) describes the quality assurance program to ensure that the completed project meets or exceeds all design criteria, plans, and specifications. The CQAPP includes protocols for sampling and testing to monitor construction activities and reporting requirements, such as summary status reports and inspection data sheets.

The CQAPP is presented in the Final Design document accompanying this RD/RA Workplan.

#### **3.3.2 Project Schedule**

The project schedule presents the estimated time frames to complete the major components of the RA. A more detailed project schedule will be submitted with the Final Design document.

#### **3.3.3 Truck Route**

The Final design will present the planned truck route for transporting impacted soils to the treatment staging area and the transporting of stabilized material to the approved off-site disposal facility.

### **3.4 TASK 3 - REMOVAL ACTION AND CONSTRUCTION**

In accordance with the schedule in Section IV of the SOW, the RA will be implemented as described in the RD/RA Workplan and Design Document. The removal action and construction activities and associated documentation and reports are described in detail in Section 4.0 of this Workplan.

### **3.5 TASK 4 - OPERATION AND MAINTENANCE**

Task 4 consists of the preparation of the Operation and Maintenance Plan to cover maintenance and repair of the existing concrete and asphalt cover and perimeter fencing for a period of 30 years. The O&M Plan will include all elements listed under Section III, Task 6 of the SOW. The O&M Plan will be submitted concurrently with the Final Design document and the Final O&M Plan will be submitted no later than the final Pre-Inspection meeting, in accordance with the schedule provided in the SOW.

## **4.0 REMEDIAL ACTION AND CONSTRUCTION**

### **4.1 PRE-CONSTRUCTION INSPECTION AND MEETING**

The Respondents, Bredt-Zanick L.L.C. and ENTACT will meet with the U.S. EPA and OEPA for a pre-construction inspection and meeting at the MMI Site. The purpose of the meeting will be to:

- Review methods for documenting and reporting inspection data;
- Review methods for distributing and storing documents and reports;
- Review work area security and safety protocols;
- Discuss any appropriate modifications of the CQAPP to ensure that site-specific considerations are addressed; and
- Conduct a site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations.

The pre-construction inspection and meeting will be documented by one of the ENTACT attendees and the transcribed minutes will be transmitted to all parties.

### **4.2 MOBILIZATION AND SITE PREPARATION**

Project mobilization and site preparation activities will be conducted to prepare the site for full-scale removal activities. Achieving a quality project according to schedule requires experienced planning and organization during the mobilization phase of the project. The site preparation activities listed below will be conducted for the MMI Site Project:

- Notify appropriate agencies for emergency response in accordance with the Health and Safety and Contingency Plan;
- Notify and coordinate with the City of Cleveland local air authorities air monitoring activities to ensure city air monitors are relocated prior to excavation activities;
- Notify suppliers and vendors to allow for timely and efficient project start up;
- Site survey and photo documentation to verify condition of remaining site structures that are adjacent to excavation areas, and overhead obstructions;
- Location of the construction office and connection of electricity, water, telephone and facsimile;
- Establish treatment area and haul road according to the approved truck route;
- Establish the coordinate grid system with 50-foot by 50-foot grid cells;
- Schedule a site utility line location (gas, electric, telephone fiber and wire, storm and sanitary sewer, water and cable);
- Construct barricade safety fences;
- Identify personnel and equipment access areas;
- Identify and construct material storage and loading areas;
- Construct decontamination areas for personnel and equipment;
- Establish work and exclusion zones;
- Install storm-water/erosion controls;
- Install water management systems for collection, dust suppression, and discharge;
- Install and initiate air monitoring systems for site perimeter, work areas and personnel; and
- Setup a meteorological data collection center in the administrative trailer.

Drawing 04 and 05 of the Final Design and Construction Quality Assurance Plan illustrates the general site layout including approximate location of existing site features, the proposed asphalt cover area and the excavation areas. The location of the exclusion zone, contamination reduction or decontamination zone and support zone will be determined as part of the site logistics during mobilization activities prior to the Pre-Construction meeting.

In order to prepare for efficient excavation, soil stabilization and loading operations, ENTACT will align numerous aspects of site control, including:

- Establish site inspection protocol and documentation requirements;
- Secure the impacted work areas to control site entry and exit.
- Implement ENTACT's sign-in log to document entry of visitors and personnel on site; and
- Post the appropriate signage to restrict and control site access.

Work Zones will be established around the perimeter of the facility. Tape and signs will be installed to identify the Exclusion, Contamination Reduction, and Decontamination Zones. Level C Personal Protective Equipment (PPE) will be required to enter the Exclusion Zone. Access to the zones will be controlled.

#### **4.2.1 Stormwater/Erosion Control Measures**

Stormwater and erosion control measures will be implemented before the management of material is initiated at the site. These control measures will include the use of berms, hay bales or drainage channels to prevent off-site run-off and control overland flow as described in the Erosion Control Plan in Appendix F to the RD/RA Workplan. These measures will be implemented, maintained, and removed pursuant to the requirements of the approved RD/RA Workplan.

#### **4.2.2 Staging and On-site Treatment Areas**

All lead stabilization processes will be carried out in a secondary containment unit placed adjacent to the staging area for the treatment of material requiring stabilization. The treatment containment unit will be constructed at the facility on a portion of the existing concrete slab with Jersey barriers, and lined with an impermeable liner. The soils to be treated will be placed inside of the constructed containment system. The treatment containment area will meet the definition of 40 CFR 260.10 that defines a container as *"any portable device in which material is stored, treated, disposed of, or otherwise handled"* and will be constructed over an existing area of concrete that is level or slightly sloped. The impermeable liner will be placed over the Jersey barriers to allow for the capture and control of lead-impacted via any stormwater run-off. Water misters will be utilized during soil handling and treatment to control dust and eliminate the potential for air-borne migration of lead.

Staged soil piles will be temporarily covered with polyurethane sheeting at the end of the day's activities or prior to inclement weather to minimize the generation of leachate or airborne lead. The staging area may be moved during the project to increase efficiency of operations. Collected wastewater will be analyzed for the NEORS discharge parameters to determine if the water can be discharged to the municipal sewer system, pending approval from the City of Cleveland, or will be shipped off-site for disposal.



The on-site treatment of the excavated soils will be conducted according to the Treatability Study Report, presented in Appendix E of this RD/RA Workplan. The Phase IV land disposal restrictions applicable to contaminated soils, for lead and any potential underlying hazardous constituent (UHC), were met for soils that contain a hazardous waste. The Treatability Study was designed to meet the applicable LDR requirement for any material that, when generated, exhibited a hazardous characteristic. The alternative LDR treatment standards for hazardous lead-contaminated soils is 7.5 mg/L TCLP lead, but the soils will be treated to be below the hazardous characteristic criterion for lead of 5.0 mg/L to render the material nonhazardous. The frequency of the sampling of the treated material to be either placed in low areas beneath the asphalt cover or to be disposed of off-site as nonhazardous waste is described in Section 3.3 of the FSAP. A detailed discussion of the treatability study is presented in Appendix E of this RD/RA Workplan.

Near completion of the on-site treatment of the material, the berm material surrounding the staging area will be tested for TCLP lead, treated if necessary to render the material nonhazardous for either on-site placement beneath the asphalt cover or off-site disposal. The concrete pad underlying the treatment containment area will be decontaminated after all treatment activities are completed.

#### **4.2.3 Air Monitoring**

Air monitoring will be conducted during the project to determine the concentrations of air-borne lead to ensure that all work personnel and surrounding residents are not exposed to levels of lead in excess of the regulated limits, and to ensure that contaminants are not migrating off site. For this project, Clean Air Act monitoring methodologies will be employed to monitor for respirable dust and lead emissions in addition to the OSHA defined air monitoring for the following purposes:

- Health and safety;
- Monitor dust suppression effectiveness; and,
- Monitor dust borne lead concentrations.

Plans in the RD/RA Workplan that describe air monitoring are the FSAP (Appendix C) and the HASP. The FSAP includes procedures for air sampling using total suspended particulate (TSP) samplers and area/personal air monitors in Section 4.0 of the FSAP. Air-sampling procedures for personal air monitoring in Section 7.1.

#### **4.2.4 Dust Suppression/Engineering Controls**

Site preparations will include positioning and implementing dust suppression and engineering control measures to ensure that air emissions are maintained at "no visible emissions" at the MMI Site boundary/fence line during the construction phase of the RA. To control dust, ENTACT will employ misting using high-pressure, low-volume, portable water spray units in the excavation, staging, treatment and loading areas and along site roads.

#### **4.2.5 Subsurface Utilities and Other Obstructions**

Prior to beginning heavy equipment operations, ENTACT will file utility line locate requests with locating services for underground utilities. Existing overhead power lines that prevent remedial activities will be either relocated or removed. Caution and awareness of power lines that remain in place will be emphasized in site safety meetings.

#### **4.2.6 Site Security**

Access to the MMI Site will be controlled by the existing perimeter fence and gates, as well as by the project manager. Site visitors that enter the work zone will be required to read, sign and comply with the HASP and must wear the appropriate personal protective equipment before entering work areas. All visitors will be required to sign the logbook, located inside the ENTACT administrative office trailer.

#### **4.2.7 Establishment of Coordinate Grid System**

A coordinate grid system (CGS) will be established using GPS or similar in order to provide a coordinate system for tracking sampling and excavation activity in the field. Figure FSAP-2 in Appendix C depicts the approximate location of the CGS. The CGS will employ square grids of 50 feet by 50 feet superimposed over the existing site and perimeter area extending out beyond the fenceline. This coordinate system will be used to provide benchmark locations and reference markers for 1) excavation documentation, 2) XRF field-screening activities, and 3) post-excavation confirmatory soil sampling. Installation and use of the CGS is described in the FSAP (Appendix C of this RD/RA Workplan.).

### **4.3 CLEARING OF SITE**

The excavation areas will be cleared of all trees and grubbed to grade for proper drainage using standard construction equipment. The trees shall be cleared to as near ground level as practicable and disposed of off-site.

Existing concrete structures that are present within the footprint of the asphalt cover system will be demolished and the debris disposed of as construction debris at an approved landfill.

In addition, all on-site drums left behind by previous contractors will be opened and the contents properly disposed. The empty drums will then be decontaminated using a steam-cleaner or pressure washer for possible recycling or disposal along with the construction debris from demolition of existing concrete structures (i.e. remaining walls from previous demolition efforts, loading docks and storage areas). Waste material generated during clearing and removal activities (i.e. PPE, concrete debris, etc.) will be disposed of off-site at an approved landfill. Any material designated for recycling will be transported to the designated decontamination area and steam-cleaned or pressure-washed to remove any surface lead before leaving the site.

### **4.4 DEMOLITION OF CONCRETE STRUCTURES**

The existing concrete structures, including partial walls, stalls and other above-grade structures, excluding the raised foundation area, will be demolished to grade using conventional construction equipment in accordance to the design specifications. All demolition services will be performed in accordance with applicable federal, state, and local requirements.

The concrete debris may be used as subbase material in areas where an asphalt cover is to be placed or disposed of off-site as construction debris. All other debris will be stockpiled for off-site disposal as construction debris.

#### **4.5 EXCAVATION, CONSOLIDATION, AND/OR TREATMENT OF SOILS**

On-site soils not covered with concrete or the cover system, and off-property perimeter soils along the eastern, western and southern boundaries of the property will be excavated until either the RBRG of 1,000 mg/Kg is reached or until historic slag fill is encountered (the "risk goals"), whichever comes first. On-site areas excavated and backfilled with clean fill in accordance to the approved Workplan during the Phase I TCR will not be addressed unless identified in the SOW as requiring additional removal. Identified grids requiring re-excavation will include only those grids that will not be covered with an asphalt cover.

Soils will be excavated with conventional construction equipment. The perimeter excavation will begin at the northeastern corner off Third Street and proceed in a southerly direction so as to minimize trafficking over areas where remedial action has occurred. For on-site soils addressed during the Phase I TCR but requiring re-excavation, the one-half to two feet of clean sand fill used as backfill will be removed and stockpiled for testing for the parameters described in Section 4.9 to determine if the material can be re-used as backfill in areas outside the asphalt cover.

Excavation will be guided by the use of an XRF field screening instrument and will be terminated either when the performance criteria is achieved or the historic slag criteria is encountered. The XRF will analyze for total lead. For any grids where excavation is terminated prior to reaching the historic slag fill, the achievement of the performance criteria utilizing the XRF will be verified by the collection of a confirmatory sample for total lead analysis at the approved fixed laboratory verification. Each confirmatory sample location will be located using GPS for documentation purposes. Once either the performance criteria has been confirmed to be met, or when historic slag fill is visually encountered, the grid will be considered successfully excavated and backfilled with clean fill material.

Excavated soils exceeding the 1,000 mg/Kg criteria will be consolidated and staged for treatment in the treatment staging area. The treatment containment area is constructed to meet the definition of a secondary container as specified in the SOW, as described in Section 4.2.2. During treatment, the soils will be spread out in the treatment containment area and the pre-determined volume of additive required to achieve the applicable performance standard for soils (<5.0 mg/L TCLP lead) will be applied over the top the material. The additive and soils will then be thoroughly mixed using either a soil stabilizer or the bucket of the backhoe until a homogenous blend of soils and additive is achieved. The treated soils will then be staged in the post-treatment staging area for verification sampling prior to off-site disposal. A detailed discussion of the treatment system and additives used is provided in Appendix E of the RD/RA Workplan.

Following stabilization, a composite sample of seven (7) aliquots will be collected from the treated material in increments of 250 cubic yard piles for the first 1,000 cubic yards of material, then in 500 cubic yard increments thereafter. The samples will be analyzed for TCLP lead to ensure the treatment standard has been met and for total lead if the material will be placed on site. Upon receipt of verification results, the material will either be used to fill low areas beneath the proposed asphalt cover or will be transported off-site to an approved Subtitle D landfill facility.

Transportation and disposal for treated soils will be described in the Final Design document that will be submitted to U.S. EPA pursuant to Section III of the SOW and the approved RD/RA Workplan.

The volume of treated material to be transported off-site is estimated at approximately 3,100 cubic yards. This includes the existing stockpiled Holmden Avenue treated material, and the perimeter and on-site soils requiring excavation and treatment (1,800 cubic yards) based on the EE/CA sampling results (USEPA, 2002; ENTACT, 1998b). All treated material placed for use in the cover system will be consolidated and graded to meet the requirements specified in the approved design document.

#### **4.6 CONSTRUCTION OF ASPHALT COVER**

The southern portion of the site designated in Drawing 05 of the Final Design document, where the concrete is deteriorated, will be covered with asphalt in accordance with the design specifications. Prior to installing the asphalt, all low areas and pits or areas off the concrete pad, as designated on the design drawings, will be filled with the appropriate base course, including sized demolition concrete debris or other stabilized material to grade. Any water that has accumulated in the pits will be pumped into temporary tanks for testing to determine whether or not the water can be discharged to the existing sewers once approval is obtained from the NEORS. Test parameters will include those required by the NEORS.

The asphalt cover will have a minimum thickness of 4-inches thick and include 2.75 inches of intermediate coarse aggregate layer and a 1.25 inch surface aggregate layer. A base course of appropriate thickness and aggregate size distribution will be used as a subbase to bridge and fortify two adjacent areas where an elevational difference has been noted (i.e. areas bordered by concrete curbs that are proposed to be removed as part of demolition). Specifications on the design, construction, and applicable testing requirements for the asphalt cover at the MMI site will be presented in the Final Design Specifications and Construction Quality Assurance Plan (Plan).

The asphalt cover has been designed to provide an engineered barrier over the underlying existing fill that may contain lead-contaminated material, since lead is the primary contaminant of concern at the Site. The asphalt cover has also been designed to minimize the potential of a release from the site by providing containment that protects human health and the environment and prevent migration of the waste by air dispersion, surface water runoff, groundwater migration, or direct contact.

The asphalt layer will be sloped to promote direct site drainage to the existing sewer system in order to prevent site ponding for redevelopment purposes.

The detailed construction schedule will be presented in the Final Design Specifications and Construction Quality Assurance Plan. An estimated schedule is shown in Figure 6-1 of this Workplan.

#### **4.7 REFURBISHMENT OF EXISTING CONCRETE SURFACE**

The existing concrete layer that will remain on site outside of the asphalt cover will be inspected to ensure that the integrity of the concrete is intact for future land reuse. Areas with significant

cracks or deterioration will be reconditioned by sealing with an impermeable epoxy or with concrete, followed by encapsulation of the concrete surface in accordance to the approved design plan.

#### **4.8 MONITORING WELL ABANDONMENT**

Four shallow monitoring wells were installed in the unconsolidated material beneath the MMI to a depth of 15 feet below grade (CTI, 1991). Only three of the four shallow monitoring wells were located during a well location survey performed as part of the EE/CA investigation in 1997. The locations of these remaining wells are illustrated in Drawing 03 of the Design Drawings.

In accordance with the SOW and AOC, all remaining wells and/or test borings at the site will be abandoned in accordance with Ohio Administrative Code (OAC) 3701-28-07 and the 1996 *State of Ohio Technical Guidance for Sealing Unused Wells*. Efforts will be made to extract the well riser and screen, if technically feasible, in accordance with the preferred state methodology. The boring should be over drilled to remove the annular seal and filter pack. The borehole should be pressure grouted using a tremie pipe as the drilling stem is removed.

However, if this is technically infeasible, per Appendix 4 of the Ohio Technical guidance document, wells completed in unconsolidated formations may be satisfactorily sealed with neat cement or sodium bentonite. In this case, the wells will be backfilled with clean sand to one foot above the top of the screen (9 feet below grade). A one-foot layer of bentonite pellets will then be placed above the sand either through a tremie pipe and tamped down to ensure there is no bridging, and hydrated. The remaining annular space will be pressure-grouted on one continuous motion from the bottom up, using a tremie pipe. The casing will be cut off flush with the concrete surface, and the concrete surface repaired with epoxy or cement and encapsulated in accordance to the procedures discussed in Section 4.6. In accordance with Ohio Revised Code (ORC) 1521.05(B), a well sealing report will be filed with the Ohio Department of Natural Resources (ODNR) on forms supplied by the Department.

#### **4.9 BACKFILLING AND SITE RESTORATION**

ENTACT will backfill all excavated areas outside the asphalt cover, and all unpaved areas disturbed by construction, with clean, suitable fill, including a minimum of six inches of topsoil suitable for vegetative growth. The backfilled areas will be graded to promote positive drainage and to control any additional ponding of water that may occur during implementation of the remedy. All applicable local codes shall be adhered to, and the run-off appropriately handled. All on-site catch basins have been determined to be functional. This functionality shall remain intact, after the non time critical removal actions.

In addition, as required under Section II, 1.1 of the SOW, the western portion of the site that was excavated during the Phase I TCR, will be re-graded with clean material and appropriately sloped to promote positive drainage.

Imported fill brought on-site from outside sources will be sampled to verify that the off-site fill materials are acceptable. The sampling will be performed by ENTACT and the sampling locations, methodologies, frequency of testing, and analytical protocols are described in FSAP. Analytical results on the total analytical levels in the imported backfill must be submitted to the USEPA before use of the backfill material.

Sample analyses required to determine whether the imported backfill material is acceptable include the eight RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver), volatile organic compounds (VOCs), pesticides/PCBs, and total petroleum hydrocarbons (TPH). Should the TPH value exceed the OEPA action level for TPH, the fill will be analyzed for semivolatile organic compounds (SVOCs).

Imported fill sampling will be performed at a rate of one, seven (7)-part composite sample for every 10,000 cubic yards of the same source material except for VOC analysis which will consist of four separate samples. Changes in the imported outside source location will require that the full parameter suite be repeated for that source material. The FSAP (Appendix C) and the QAPP (Appendix D) provide additional details on the sampling requirements and procedures for the backfill characterization.

#### **4.10 TRANSPORTATION AND DISPOSAL OF EXCAVATED MATERIAL**

The transportation and the disposal plan for any treated material not used to fill low areas beneath the asphalt, will presented in the truck route included as part of the Final Design Specifications.

#### **4.11 CLEAN-UP AND DEMOBILIZATION**

Upon completion of all site activities, all temporary construction facilities and utilities will be removed or disconnected. All trash, debris, and extra soil shall be removed from the site.

A Pre-final Inspection shall be conducted with representatives from the U.S. EPA, OEPA, Bredt-Zanick L.L.C., ENTACT and the PRP Respondent Group. ENTACT will notify the USEPA within 30 days after a preliminary determination has been made that the construction is complete. The purpose of the inspection is to determine whether all aspects of the RD/RA Workplan and Design Plans have been implemented at the site, and whether the remedy is operational and meeting the Performance Standards.

## **5.0 WORK PRODUCTS**

### **5.1 DAILY, WEEKLY AND MONTHLY REPORTS**

ENTACT will prepare and maintain daily work reports and other records to summarize all site activities performed during completion of removal activities. At a minimum, the daily work reports will include a listing of personnel on-site, equipment utilized, work performed, problems encountered (if any) and resolutions, and related information.

ENTACT will prepare status reports on a weekly basis to summarize activities performed at the site during the previous week.

ENTACT will also prepare written monthly progress reports that:

- Describe the actions which have taken place during the month;
- Include a summary of all results of sampling and tests and all other data received or generated during the month;
- Identify all documents completed and submitted during the month;
- Describe all actions which are scheduled for the next six weeks, and information regarding construction progress;
- Include any Workplan modifications proposed/approved; and
- Describe activities undertaken in support of the community relations plan during the month and in the near future.

These monthly progress reports shall be submitted to USEPA and to the State by the tenth day of every month. ENTACT will notify USEPA of the occurrence of any change in schedule described in the monthly progress report for the performance of any activity no later than five days prior to performance of the activity.

An authorized representative of ENTACT will sign all reports (other than the monthly progress report described above).

### **5.2 EMERGENCY NOTIFICATION**

Upon the occurrence of any event during the performance of the RA that ENTACT is required to report pursuant to CERCLA Section 103, 42 U.S.C. § 9603, or Section 304 of the Emergency Planning and the Community Right to-Know Act, 42 U.S.C. § 11004, ENTACT will notify the U.S. EPA within 24 hours of the onset of the event.

### **5.3 PHOTOGRAPHIC DOCUMENTATION**

Photographs will be taken in order to serve as a pictorial record of work progress, problems, and mitigation activities. ENTACT's file at the site will contain color prints, labeled with the date and subject of the photograph. Photographic reporting data sheets, where used, will be cross-referenced with observation and testing data sheet(s), and/or construction problem and solution data sheet(s). Photographic documentation will be included in the RA Final Report.

#### **5.4 REMEDIAL ACTION SUBMITTALS**

During the implementation of the RA the following submittals will be provided to U.S. EPA and the OEPA for review and/or approval pursuant to the schedule established in the SOW and the approved RA Workplan:

- Final Design Document
- Draft Operation and Maintenance Plan
- Final Operation & Maintenance Plan

#### **5.5 INSPECTION MEETINGS**

During the implementation of the RA, at a minimum, the following meetings will be conducted at the site pursuant to the schedule in the approved SOW and the approved RA Workplan:

- Pre-Construction Inspection
- Pre-Final Inspection
- Final Inspection

#### **5.6 FINAL INSPECTION AND RA REPORTS**

Within 15 days after completion of the Pre-final inspection, ENTACT will submit the Pre-final Inspection Report. Within 45 days following a fully successful final inspection, ENTACT will submit a written report documenting remedial action activities and requesting certification.



## **6.0 PROJECT SCHEDULE**

A project schedule for the required construction activities and the major deliverables is presented in Figure 6-1.

## 7.0 REFERENCES

Compliance Technologies, Inc. (CTI), January 17, 1991. *Groundwater Analyses Report for Master Metals, Inc., Cleveland, Ohio*

Ecology & Environment (E&E), August, 1992. *Site Assessment Report for the Master Metals, Inc. Site, Cleveland, Cuyahoga County, Ohio*. Prepared for Duane Heaton, Deputy Project Officer, Emergency Support Section, EPA Region 5.

ENTACT, Inc. (ENTACT), November 23, 1998b. Phase II Engineering Evaluation and Cost Analysis (EE/CA) Report for the Master Metals Site, Cleveland, Ohio. Prepared for the EPA Region 5 on behalf of the Master Metals PRP Group in Response to the April 17, 1997 Administrative Order by Consent Pursuant to Section 106 of CERCLA issued by the USEPA.

ENTACT, April 24, 1998a. Phase I Final Report for Time-Critical Removal Action at the Master Metals Site, Cleveland, Ohio. Prepared for the EPA Region 5 on behalf of the Master Metals PRP Group in Response to the April 17, 1997 Administrative Order by Consent Pursuant to Section 106 of CERCLA issued by the USEPA.

ENTACT, Inc. (ENTACT), February 6, 1998c. Final Report for Removal Activities at the Holmden Avenue Site, Cleveland, Ohio. Prepared for the EPA Region 5 on behalf of the Holmden Avenue PRP Respondent Group.

ENTACT, May 9, 1997. Phase I Time-Critical Removal Action Workplan for the Master Metals Site, Cleveland, Ohio. Prepared for the EPA Region 5 on behalf of the Master Metals PRP Group in Response to the April 17, 1997 Administrative Order by Consent Pursuant to Section 106 of CERCLA issued by the USEPA.

Environmental Strategies Corporation (ESC), February 15, 1991. Environmental Risk Assessment Final Report, Master Metals Site, Cleveland, Ohio. Prepared for Master Metals, Inc..

United States Environmental Protection Agency (USEPA), September 2002. *Administrative Order by Consent Pursuant to Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 -Master Metal Superfund Site, Cleveland, Ohio*.

USEPA, 2002. *Statement of Work (SOW) for the Design/Construction and Cleanup at the Master Metals Superfund Site, Cleveland, Cuyahoga County, Ohio*.

USEPA, March, 1999. *U.S.EPA Proposes Clean-up Plan for Master Metals Site, Cleveland, Ohio*. Office of Public Affairs, Region 5, Chicago, Illinois.

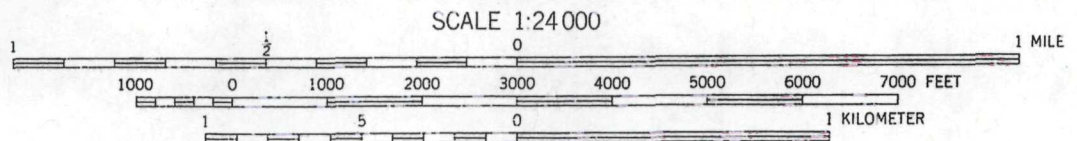
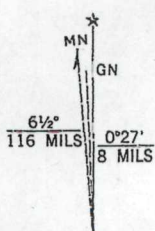
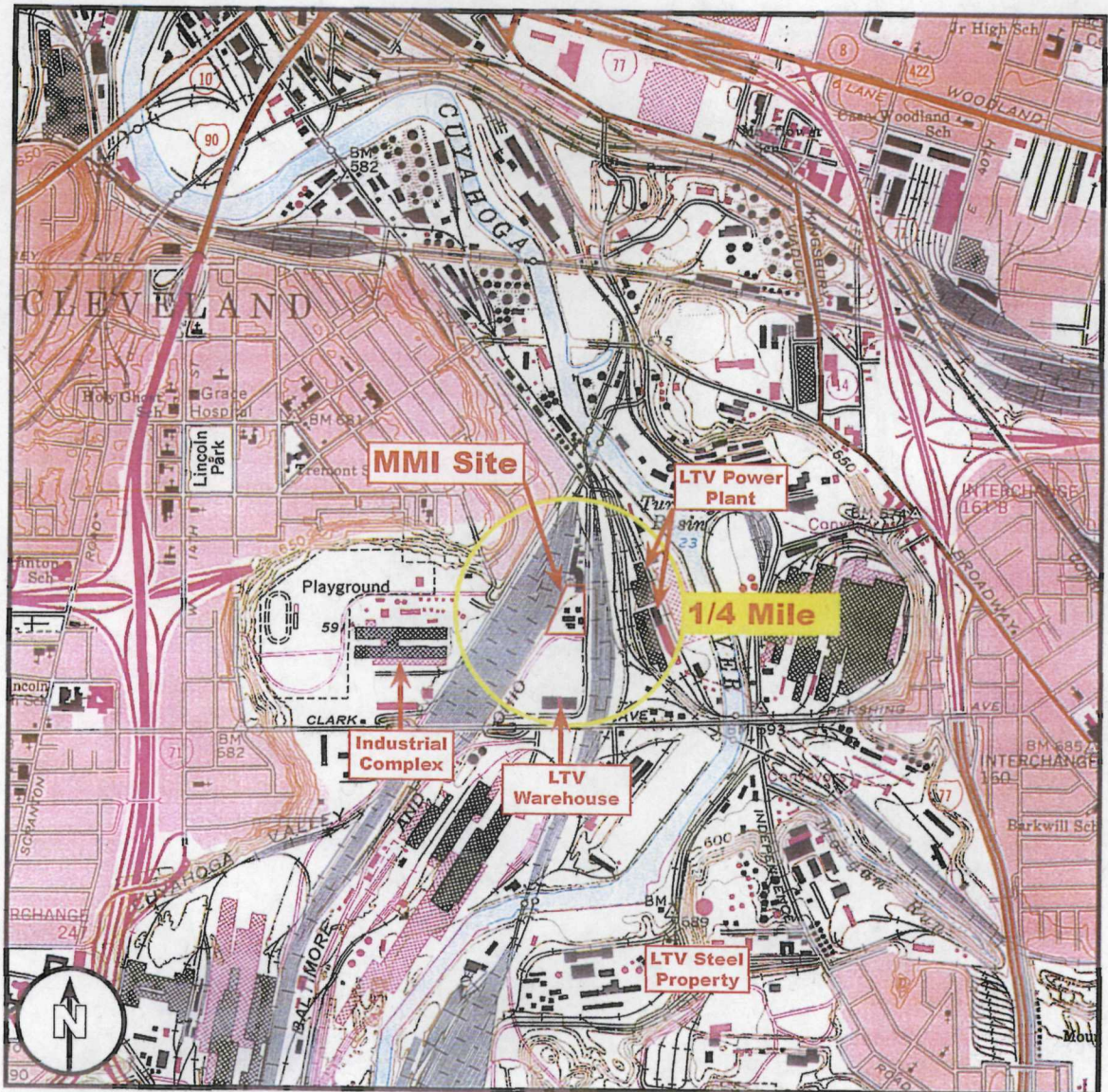
USEPA, April 17, 1997. *Administrative Order by Consent Pursuant to Section 106 of CERCLA*.



# SITE LOCATION MAP

**ENTACT**  
Leading the Nation in Customer Care.

CLEVELAND SOUTH QUADRANGLE OHIO-CUYAHOGA CO.  
7.5 MINUTE SERIES (TOPOGRAPHIC)



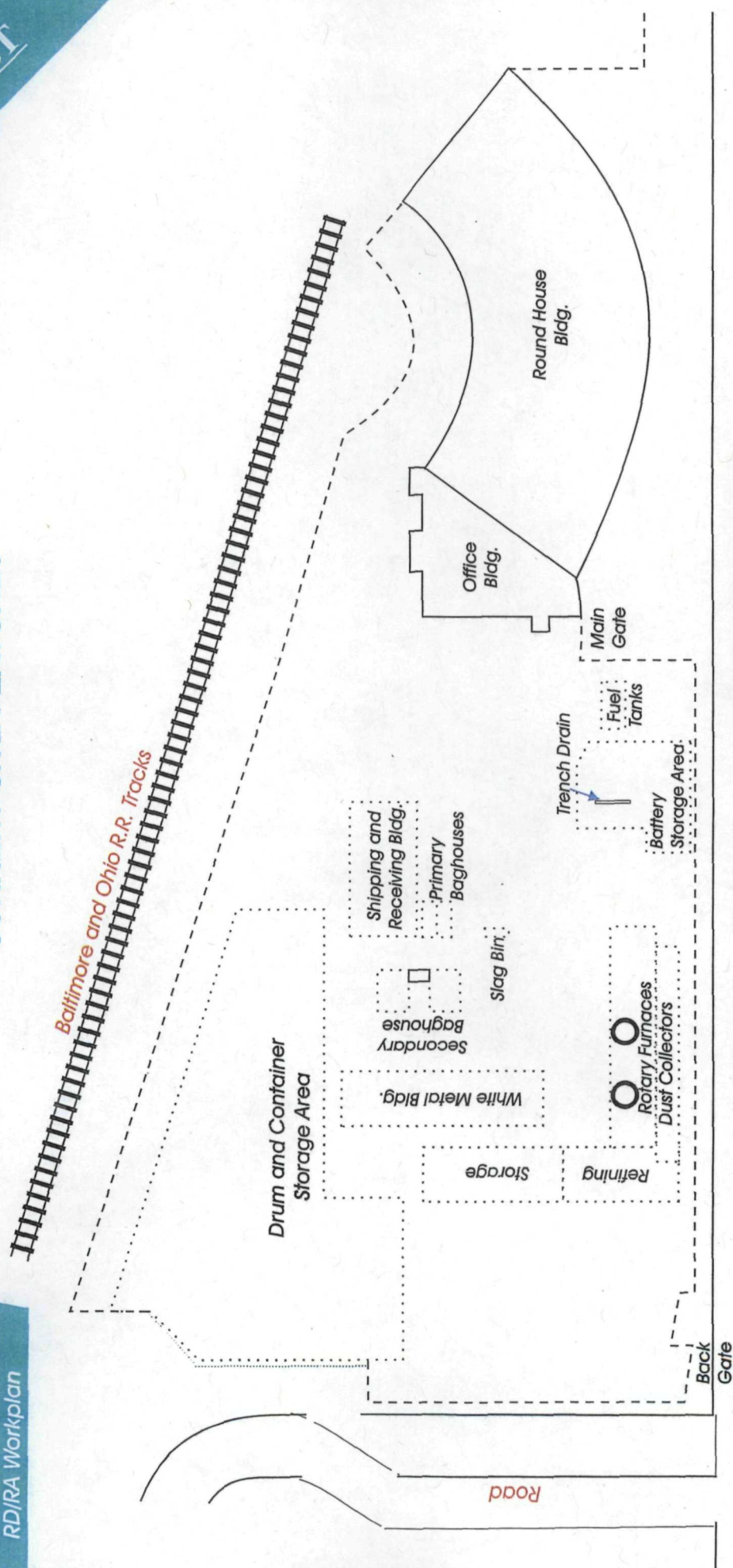
CONTOUR INTERVAL 10 FEET  
NATIONAL GEODETIC VERTICAL DATUM OF 1929  
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS LOW WATER 570.5 FEET

UTM GRID AND 1984 MAGNETIC NORTH  
DECLINATION AT CENTER OF SHEET

Figure 1-1



FIGURE 1-2  
CURRENT SITE FEATURES



West Third Street

Baltimore and Ohio R.R. Tracks

LEGEND

- Boring Location (~3')
- ▲ Surface XRF Sample Location
- Boring Location
- Fence
- Former Structures
- ▤ Rail/Road Tracks

NOTES:

- Site Plan Not To Scale





# MASTER METALS

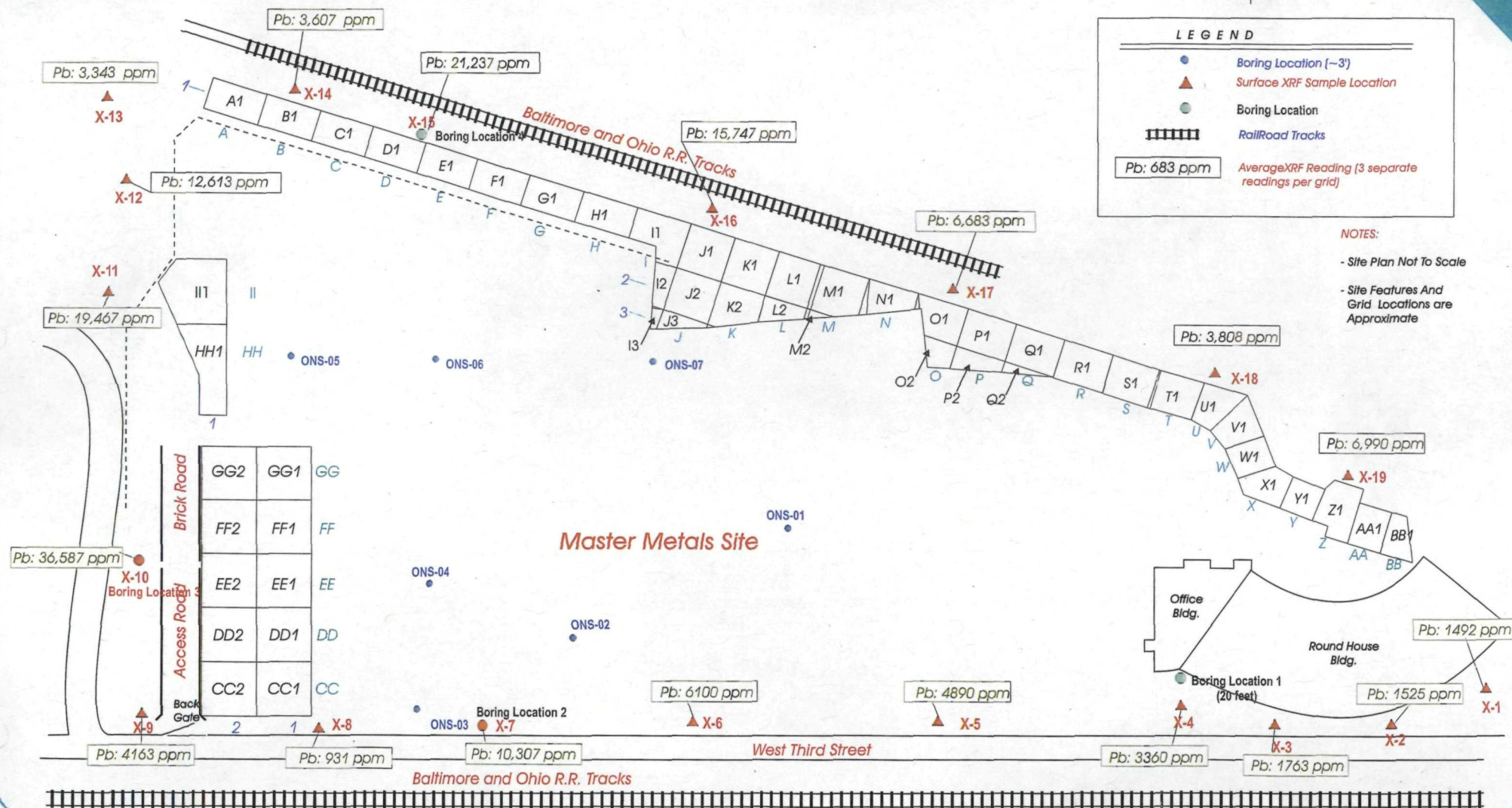
## SITE

Cleveland, Ohio

Figure 1-3  
PHASE I GRID EXCAVATIONS AND PHASE II EE/CA SAMPLE LOCATIONS

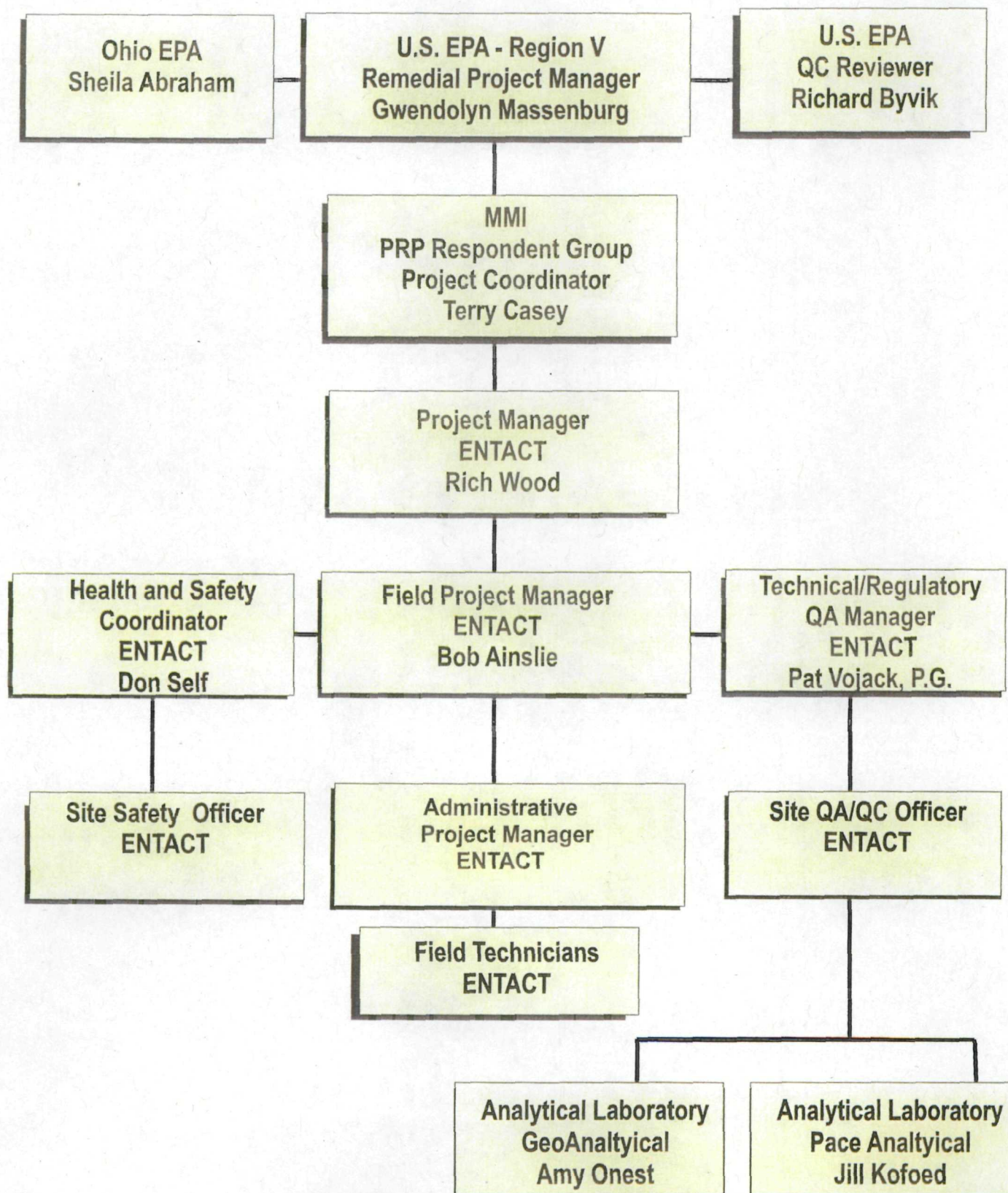


ENTACT





**Figure 2-1  
PROJECT ORGANIZATIONAL CHART**





**Figure 3-1**  
**Deliverable Schedule**  
**Master Metals, Inc., Cleveland, Ohio**

Mandated Submittals / Meetings	Due Date to Agency
<b><i>Removal Design Phase:</i></b>	
Draft RD/RA Work Plan <sup>[1]</sup>	60 days after effective date of order
Final RD/RA Work Plan	30 days after receipt of comments on Draft
Pre-final Design <sup>[2]</sup>	60 days after effective date of order
Final Design/Draft O&M Plan	30 days after receipt of Agency comments on Pre-design
<b><i>Removal Action Phase:</i></b>	
Award of RA Contract Letter	30 days after receipt of Agency's Approval of RD/RA Workplan
Pre-construction inspection and meeting	15 days after award of RA Contract
Initiate Construction	15 days after pre-construction meeting and inspection
Pre-final Inspection	No later than 15 days after completion of construction
Pre-final Inspection Report	15 days after completion of pre-final inspection
Final Inspection	15 days after completion of work identified in prefinal inspection report
Final O&M Plan	No later than Pre-final Inspection
Completion of RA Report	due 45 days after fully successful final inspection
Completion of Work Report	due 45 days after completion of all remedial activities including O&M.
Monthly Progress Reports	Due on monthly basis throughout RD/RA following approval of Final WP

**NOTES:**

[1]: Draft RD/RA Work Plan will include the following documents: Work Plan, Performance Standards Verification Plan, Field Sampling Plan, Quality Assurance Project Plan, Treatability Study, Erosion Control Plan, Community Relations Plan, and Health and Safety and Contingency Plan (submitted under separate cover).

[2]: 95% complete design



Activity ID	Description	Original Duration	Early Start	2002	2003	2004
				SEP	OCT	NOV
<b>Master Metals-Cleveland, Ohio</b>						
<b>Pre-construction Activities</b>						
0003	Preparation of Work Plan and Design Documents	0				
0005	Incorporate comments on WP and Design Documents	0				
0002	Submittal of Final Workplan & Design (Complete)	0	09/18/02 A			
0004	Customer Review of Design Documents (Complete)	0	09/18/02 A			
0006	OEPA and USEPA Document Review (Complete)	0	09/18/02 A			
0001	AOC Signed by All Parties	0	09/25/02 A			
0007	Approval of Work Plan and Design Documents	0	11/01/02 A			
0008	Pre Construction Conference	1	11/18/02 *			
<b>2002 Activities</b>						
0009	2002 Field Activities	12 *	11/18/02			
0010	Mobilization-Phase 1 (2002)	2	11/18/02 *			
0011	Abandon Monitoring Wells	3	11/20/02			
0017	Demolish Structures	5	11/21/02			
0019	Clean & Dispose Drums & Contents	1	11/21/02			
0013	Abandon Underground Utilities	4	12/02/02			
0021	Fill and Grade Low Areas, (Pits and Depressions)	4	12/02/02			
<b>2003 Activities</b>						
3019	2003 Pre Construction Meeting	0	02/25/03 *			
3009	2003 Field Activities	30 *	03/17/03			
3100	Mobilization-Phase 2 (2003)	2	03/17/03 *			
3110	Clear and Grub	2	03/19/03			
3120	Remove Site Fence & Install Temporary Fencing	1	03/21/03			
3130	Excavate and Stabilize Perimeter Soils	15	03/24/03			
3140	Offsite Disposal	8	04/07/03			
3160	Backfill, Topsoil, Seed Excavated Perimeter Area	8	04/14/03			
3170	Grade Subbase and Place asphalt	2	04/17/03 *			
3180	Refurbish Concrete	4	04/17/03			
3190	Install New Perimeter Fence	2	04/21/03			
3200	Survey	1	04/23/03			
3210	Demobilization	3	04/23/03			
<b>Project Closeout</b>						
0027	Preparation of O&M Plan	10	04/28/03 *			
0028	Pre-Final inspection	1	05/12/03			
0029	Pre-Final Inspection Report	1	05/26/03			
0030	Final Inspection	1	06/09/03			
0031	Final Report	1	06/30/03 *			
Start date	09/02/02	ENTACT and Associates, LLC		<div>Early bar</div> <div>Critical point</div>		
Finish date	06/27/03	Master Metals, Cleveland		<div>Progress bar</div> <div>Summary point</div>		
Data date	11/04/02	Estimated Project Schedule		<div>Critical bar</div> <div>Start milestone point</div>		
Run date	11/13/02			<div>Summary bar</div> <div>Finish milestone point</div>		
Page number	1A	* Summary Activity		<div>Progress point</div>		
© Primavera Systems, Inc.		Note: 2003 activities could be earlier or later than shown depending on asphalt plant opening				



**APPENDIX A**

**September 25, 2002 Administrative Order On Consent and  
Statement of Work**

Effective date  
9/25/02

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION 5

IN THE MATTER OF: ) Docket No. V-W- '02-C-711  
)  
Master Metals, Inc., ) ADMINISTRATIVE ORDER BY  
Superfund Site, ) CONSENT PURSUANT TO  
Cleveland, Ohio ) SECTIONS 106(a), 107,  
) AND 122 OF THE  
) COMPREHENSIVE  
) ENVIRONMENTAL RESPONSE,  
Respondents: ) COMPENSATION, AND  
) LIABILITY ACT OF 1980,  
Listed in Attachment A ) as amended, 42 U.S.C.  
) \$9606(a), 9607, AND 9622  
Limited Respondents for )  
Operation and Maintenance Only )  
Listed in Attachment B )

I. JURISDICTION AND GENERAL PROVISIONS

This Order is entered voluntarily by the United States Environmental Protection Agency ("U.S. EPA") and the Respondents. The Order is issued pursuant to the authority vested in the President of the United States by Sections 106(a), 107 and 122 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended ("CERCLA"), 42 U.S.C. §§9606(a), 9607 and 9622. This authority has been delegated to the Administrator of the U.S. EPA by Executive Order No. 12580, January 23, 1987, 52 Fed. Reg. 2923, and further delegated to the Regional Administrators by U.S. EPA Delegation Nos. 14-14-A, 14-14-C and 14-14-D, and to the Director, Superfund Division, Region V, by Regional Delegation Nos. 14-14-A, 14-14-C and 14-14-D.

This Order provides for performance of removal actions and reimbursement of response costs incurred by the United States in connection with property located at the former Master Metals, Inc., facility, 2850 W. Third St., Cleveland, Ohio, (the "MMI Facility") and contamination at and around residential property at 1157, 1159 and 1167 Holmden Avenue, Cleveland, Ohio (the "Holmden Properties"). These areas collectively constitute the "Master Metals Site" or the "Site". This Order requires the Respondents to conduct removal actions described herein to abate an imminent and substantial endangerment to the public health, welfare or the environment that may be presented by the actual or threatened release of hazardous substances at or from the MMI Facility.

A copy of this Order will also be provided to the State of Ohio, which has been notified of the issuance of this Order pursuant to Section 106(a) of CERCLA, 42 U.S.C. §9606(a).

Respondents' participation in this Order will not constitute an admission of liability nor admission of U.S. EPA's findings or determinations contained in this Order except in a proceeding to enforce the terms of this Order. Respondents agree to comply with and be bound by the terms of this Order. Respondents further agree that they will not contest the basis or validity of this Order or its terms.

## **II. PARTIES BOUND**

This Order applies to and is binding upon U.S. EPA, and upon Respondents and Respondents' heirs, receivers, trustees, successors and assigns. Any change in ownership or corporate status of Respondents including, but not limited to, any transfer of assets or real or personal property will not alter such Respondents' responsibilities under this Order. Respondents are jointly and severally liable for carrying out all activities required by this Order except for those activities outlined in this Order that are to be undertaken solely by the Limited Respondents for Operation and Maintenance Only. Compliance or noncompliance by one or more Respondents with any provision of this Order will not excuse or justify noncompliance by any other Respondent.

Respondents will ensure that their contractors, subcontractors, and representatives comply with this Order. Respondents will be responsible for any noncompliance with this Order.

## **III. FINDINGS OF FACT**

Based on available information, including the Administrative Record in this matter, U.S. EPA hereby finds that:

1. The Master Metals Site is comprised of both the MMI Facility and a nearby residential property area, the Holmden Properties, where Master Metals lead-bearing materials were deposited as fill.
2. The MMI Facility is located in the "flats" area of downtown Cleveland, in an industrialized sector of the City. This property encompasses 4.3 acres. It is bordered on two sides by railroad tracks, with an LTV Steel facility located

immediately to the east and south. The Cuyahoga River is located approximately 1,500 feet to the east. A playground and athletic field are located approximately 1,500 feet to the west and the nearest residential area begins approximately 2,000 feet to the northwest.

3. The Holmden Properties are located in a residential neighborhood, atop a hillside overlooking the flats. These properties encompass one-half acre. They are surrounded on the north, east and west by continuing residential areas and on the south and southeast by industrial areas located at the bottom of the hillside.
4. Persons, including but not limited to the Respondents listed in Attachment A, arranged for disposal or treatment or arranged with a transporter for transport for disposal or treatment of hazardous substances at the Master Metals Site or accepted hazardous substances for transport to disposal at the Master Metals Site.
5. Persons, including but not limited to the Respondents listed in Attachment A, are current or past owners of the Site, or prior to July 1987 arranged for disposal or treatment, or prior to July 1987 arranged with a transporter for transport for disposal or treatment of hazardous substances at the Site, or accepted hazardous substances for transport to disposal or treatment at the Site or at the Holmden Properties.
6. Respondent NL Industries, Inc. ("NL") initially constructed the MMI Facility in 1932, building it on slag fill. NL owned and operated the MMI Facility as a secondary lead smelter, producing lead alloys from lead-bearing dross and lead scrap materials. NL also engaged in battery cracking as part of its operations.
7. Master Metals purchased the MMI Facility in 1979. Master Metals thereafter continued to run the MMI Facility as a secondary lead smelter, receiving lead-bearing materials from off-Site sources. The lead-bearing feed material received by Master Metals was classified and regulated under the Resource Conservation and Recovery Act ("RCRA"), 42 U.S.C. §§ 6901 et seq., as "D008" hazardous waste. In its operations, Master Metals used rotary and pot furnaces to convert these lead-bearing materials into lead ingots. Each furnace used by Master Metals contained a baghouse, a pollution screening structure that collected particulate matter from the furnace. The collected dust

comprised approximately 60 percent lead. The sludge remaining in the furnaces after smelting was classified and regulated under RCRA as "K069" hazardous waste.

8. By-products from the smelting operation included furnace flux, slag, dross, baghouse fines and furnace sludge. Excluding slag, most of the material was recycled back into the furnaces. Slag was tested and disposed of off-site. Cooling water was diverted to the City of Cleveland sewer system. Finished lead ingots were stored in the roundhouse at the north end of the property prior to shipment off-site.
9. Master Metals had a long history of non-compliance with various state and federal environmental, health and safety laws, as well as a history of poor operating practices; releases of hazardous materials to the environment, including the MMI Facility property, have been documented.
10. On November 19, 1980, Master Metals filed a "Part A permit" pursuant to RCRA, thereby obtaining "interim status" under RCRA to operate certain of the MMI Facility's waste piles and treatment units, as well as a container-based storage area.
11. Master Metals filed for Chapter 11 bankruptcy on January 11, 1982, in the United States Bankruptcy Court for the Northern District of Ohio. It subsequently went into reorganization. Prior to November 8, 1985, Master Metals submitted a Part B RCRA application. However, on November 8, 1985, the hazardous waste piles at the MMI Facility that contained lead-bearing dusts lost interim status for failure to comply with financial assurance requirements of 40 C.F.R. Part 265, Subpart H.
12. The United States filed a complaint for violations of RCRA on June 15, 1987, in the United States Bankruptcy Court for the Northern District of Ohio, seeking closure of the D008/K069 waste piles and compliance with RCRA financial responsibility requirements. On September 4, 1987, Master Metals and the United States entered a Stipulation to resolve these RCRA violations.
13. In the late summer of 1987, agents or employees of Master Metals deposited lead-bearing materials from the MMI Facility at the Holmden Properties as fill. These same agents or employees of Master Metals dumped some lead-

bearing materials from the MMI Facility over the edge of the Holmden Properties hillside.

14. In August 1987, Master Metals submitted a partial closure plan to the United States that included procedures to close the D008 and K069 waste piles. Master Metals was to submit an additional closure plan to address all other regulated solid waste management units at a later date. As part of the partial closure plan, Master Metals sampled subsurface soil from the battery storage area waste pile. The soil in this area contained cadmium and lead, but was not considered hazardous according to the U.S. EPA's Environmental Profile ("EP") toxicity criteria. Groundwater between three and ten feet below ground surface contained concentrations of lead.
15. On January 15, 1990, Master Metals entered into a Consent Decree with the United States to resolve continuing RCRA violations. This Consent Decree required, among other things, that Master Metals properly track all hazardous waste at the MMI Facility; submit annual reports to State of Ohio's Environmental Protection Agency ("Ohio EPA"); cease battery cracking at the MMI Facility; conduct an investigation to determine subsurface and groundwater conditions at the MMI Facility; characterize waste at the MMI Facility; store the waste properly; close the waste piles containing hazardous waste in accordance with an approved RCRA closure plan; establish closure trust funds or other authorized mechanisms; fund those mechanisms in compliance with RCRA requirements; and establish RCRA required financial liability coverage.
16. Between January 15, 1990, and August 17, 1990, Master Metals accumulated over 1,500 alleged violations of the Consent Decree, spanning 19 decree provisions. Master Metals also committed additional RCRA permit violations during this period, and continued to demonstrate noncompliance with other health and safety standards. These violations included poor handling and control of toxic waste by Master Metals, such that toxic waste remained exposed to the environment at the MMI Facility.
17. In April 1990, Master Metals submitted to the U.S. EPA a revised RCRA "Part B permit" application for closure of various solid waste management units.
18. In August 1990, the United States filed a motion for civil contempt in the District Court for the Northern

District of Ohio regarding Master Metals's Consent Decree violations. The Court denied that motion, granting Master Metals six months to achieve compliance. The United States filed the motion for contempt again in January 1991 with the same result. In May 1991, the Court granted the motion, requiring Master Metals to cease operations in July 1991. However, the Court reconsidered this motion in June and denied the plaintiff government's relief.

19. In addition, on November 9, 1990, the United States demanded by letter \$2,286,500 from Master Metals in stipulated penalties for Master Metals Consent Decree violations from January 15, 1990, to August 17, 1990. On June 26, 1992, the United States reached its final determination on these stipulated penalties for Master Metals, reducing Master Metals's stipulated penalty to \$1,593,000. Master Metals appealed this determination to the District Court for the Northern District of Ohio pursuant to the Decree's provision on dispute resolution. The District Court, however, never ruled on the penalties. The United States filed a motion to dismiss in October 1996 on the grounds of mootness, which the Court granted in an October 29, 1996 Order.
20. In December 1990, Master Metals contracted with Compliance Technologies, a consulting firm, to install and sample groundwater monitoring wells on the Master Metals Site. Analytical results from the four monitoring wells indicated that the surrounding groundwater was contaminated at levels greater than the maximum contaminant levels (MCLs) for lead and cadmium established under the Safe Drinking Water Act, 42 U.S.C. § 300f et seq.
21. Analysis of MMI Facility soil samples for pH levels and total metals by a U.S. EPA-approved laboratory revealed that the MMI Facility's soil contained elevated levels of barium, cadmium, chromium, lead and nickel. The southern portion of the MMI Facility near the drum storage area contained concentrations of lead exceeding 10,000 parts per million. Elevated lead levels were also discovered near the battery cracking area.
22. In August 1991, Ohio EPA collected samples of raw materials from the Master Metals rotary furnace and two waste bins as part of the Consent Decree requirements. These samples contained lead concentrations as high as 5,349 mg/l.

23. Prior to September 1991, the occupants of 1157 Holmden Avenue at the Holmden Properties contacted Ohio EPA, stating that they believed that Master Metals fill material deposited on their property constituted hazardous waste. The occupants believed that the fill material was hazardous waste because of its distinctive odor and color, because vegetation died and would not grow in the filled area, and because their daughter's feet burned when she walked over the filled area in her bare feet.
24. On September 17, 1991, Ohio EPA began soil sampling at the Holmden Properties. Analysis of these samples by a U.S. EPA approved laboratory showed significant levels of lead and cadmium. Ohio EPA required Master Metals to remove contaminated soils from the Holmden Properties. In March 1992, after the clean-up, Ohio EPA sampled again the soil at the Holmden Properties and discovered additional contamination. Lead was detected in concentrations as high as 7,210 ppm in Holmden Properties soils.
25. In July 1992, U.S. EPA contracted with an outside technical assistance team (TAT) to collect soil samples on and around the MMI Facility property to determine if the MMI Facility contaminants were subject to airborne transport. Analysis of these samples for RCRA metals and Toxicity Characteristic Leachate Procedure (TCLP) metals by a U.S. EPA-approved laboratory revealed that TCLP lead was present in concentrations more than 200 times greater than the RCRA regulatory level of 5 mg/l, at all sample location points except for one MMI Facility location and one location off of the MMI Facility. MMI Facility soil samples indicated the presence of TCLP arsenic and cadmium, with one location testing at 115,000 ppm for lead. Surface samples collected from off of the MMI Facility near both the Valleyview Apartments complex, which is 1,500 feet northwest of the Facility, and near the Tremont Valley Park which is 2,000 feet northwest of the Facility, were found to contain lead concentrations ranging from 148 to 1,850 ppm. The source of this latter lead contamination has not been conclusively traced to the MMI Facility.
26. Three ambient air monitors were installed by the Ohio EPA near the facility property in January of 1992. During the first two quarters of 1992, air samples collected from the station immediately downwind of Master Metals revealed exceedances of the Clean Air Act's National Ambient Air Quality Standards ("NAAQS") for lead, 42 U.S.C. §§ 7401 et seq. In April and May 1992, four more NAAQS violations were



recorded. In July 1992, Master Metals installed a sprinkler system in an attempt to prevent airborne lead from migrating off the MMI Facility property.

27. On August 3, 1992, Ohio EPA ordered an immediate 30-day shut down of the MMI Facility because of Master Metals's "life-threatening" violations of the NAAQS for lead. During Master Metals's shutdown, downwind ambient air monitoring data collected by Ohio EPA registered lead levels in violation of the NAAQS for lead on every day except one. An unknown portion of these NAAQS violations were due to lead-laden MMI Facility dust migrating off of the MMI Facility via prevailing winds. To minimize the effects of wind-blown MMI Facility dust, on September 9, 1992, Master Metals directed a thorough cleaning of the MMI Facility.
28. In December 1992, Master Metals removed additional contaminated soils from the Holmden Properties as ordered by Ohio EPA. After this excavation, Master Metals collected additional soil samples at the Holmden Properties. Analysis of these samples showed elevated levels of lead as high as 57,000 ppm.
29. On August 5, 1993, the Ohio EPA director ordered Master Metals to cease operating the MMI Facility until it could demonstrate compliance. Despite the shutdown of the MMI Facility's furnaces on this date, a U.S. EPA downwind air monitoring station routinely detected elevated lead concentrations as much as 500 times greater than the upwind concentrations and 33 times the NAAQS quarterly average. An unknown portion of these NAAQS violations were due to the lead-laden MMI Facility dust migrating off of the MMI Facility property via prevailing winds.
30. Shortly after Master Metals was shut down, Bank One of Akron, Ohio, took possession of all of Master Metals's cash collateral and accounts receivable.
31. After Master Metals's shutdown, Master Metals and U.S. EPA continued negotiations to resolve Master Metals's RCRA noncompliance. As part of these negotiations, Master Metals and Mr. Mickey, the now-deceased former President of Master Metals, provided financial information to U.S. EPA.
32. On March 28, 1995, U.S. EPA's RCRA Division referred the Master Metals Site to CERCLA for cleanup. In an August 22, 1995 letter, Master Metals withdrew all permits still in effect regarding its operation, effectively terminating its

ability to legally treat, store or dispose of hazardous waste at the MMI Facility.

33. The occupants of 1157 Holmden Avenue at the Holmden Properties were unable to ever return to their home. The house on the property was vandalized during its vacancy, and later damaged by arson. The City of Cleveland condemned the house on August 18, 1995. On February 22, 1996, the City demolished it.
34. Throughout 1995 and 1996, vandals and scavengers visited the MMI Facility on an intermittent basis. Further, in 1995 or 1996, Master Metals partially demolished one of the MMI Facility structures, leaving piles of rubble, girders and sheet metal standing around the structure's remains.
35. On April 9, 1997, additional Site investigation began at the Holmden Properties. This investigation included sampling which revealed that the Holmden Properties contained approximately 2,000-3,000 cubic yards of lead-impacted materials exceeding the 400 ppm default cleanup criteria set for that investigation. Lead levels as high as 8,350 ppm were detected.
36. Fifty-three potentially responsible parties (the "Smelter Respondents") signed an Administrative Order by Consent for the Master Metals Site, which became effective April 17, 1997, ("Smelter Order"). The Smelter Order required the Smelter Respondents to conduct a time-critical removal action in Phase I. In Phase II the Smelter Order required the Smelter Respondents to complete an Engineering Evaluation and Cost Analysis ("EE/CA") for a non-time-critical removal action for the MMI Facility, pursuant to the National Contingency Plan ("NCP"), 40 C.F.R. Part 300, as amended, and the Superfund Accelerated Cleanup Model ("SACM") guidance. These removal actions were required to abate an imminent and substantial endangerment to the public health, welfare or the environment that may have been presented by the actual or threatened release of hazardous substances at or from the MMI Facility. This order also required the Smelter Respondents in Phase II to prepare an EE/CA report of alternative response actions pursuant to 40 C.F.R. §300.415(b)(4)(i), and the SACM guidance, to address the remaining environmental concerns at the MMI Facility.
37. On May 13, 1997, the Smelter Respondents submitted a Phase I time-critical removal action workplan for the MMI

Facility to the U.S. EPA for approval. In Phase I, the Smelter Respondents performed the following time-critical removal actions:

- a. Analysis and mapping of waste materials and contamination at the MMI Facility for removal purposes;
  - b. Long-term securing of the MMI Facility against trespassers through the use of fences, signs and other devices, as necessary;
  - c. Excavation, demolition, consolidation, and/or removal of highly contaminated buildings, structures, soils, loose waste materials, demolition debris, machinery, garbage, dusts, post-industrial debris and office or industrial equipment where such actions reduced the spread of, or direct contact with, the contamination;
  - d. Removal of drums, barrels, tanks, or other bulk containers that contained or may have contained hazardous substances or pollutants or contaminants where such actions reduced the likelihood of spillage or of exposure to humans, animals or the food chain; and
  - e. Containment, treatment, disposal, or incineration of hazardous materials, where such action was necessary to reduce the likelihood of human, animal or food chain exposure.
38. On August 8, 1997, the Smelter Respondents submitted the Phase II EE/CA workplan for the MMI Facility to the U.S. EPA for approval. Phase II involved preparing an EE/CA Report identifying and analyzing alternative response actions necessary to complete the non-time critical removal action. The EE/CA was to be consistent with U.S. EPA's guidance entitled, "Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA", EPA/540-R-93-057, Publication 9360.32, dated August 1993.
39. On October 1, 1997, the Smelter Respondents submitted the EE/CA sampling plan for U.S. EPA's approval.
40. On October 23, 1997, six potentially responsible parties ("Holmden Respondents") signed an Administrative Order by Consent for the Holmden Properties ("Holmden Order"). The Holmden Order required the Holmden Respondents

to conduct a time-critical removal action at the Holmden Properties pursuant to the NCP and SACM guidance, to abate an imminent and substantial endangerment to the public health, welfare or the environment that may have been presented by the actual or threatened release of hazardous substances at or from the Holmden Properties.

41. On October 15, 1997, the Holmden Respondents submitted a plan of remediation activities for U.S. EPA's approval.
42. On January 19, 1998, the Smelter Respondents submitted the EE/CA data report for the MMI Facility for U.S. EPA's approval.
43. On February 6, 1998, the Holmden Respondents submitted a final report for the removal activities at the Holmden Properties. The Holmden Respondents treated the excavated contaminated soils to below current regulatory levels and below the Land Disposal Restriction level of 0.75 mg/L TCLP for lead. After the removal, the Holmden Respondents restored the Holmden Properties to the properties' original condition including revegetation.
44. On April 24, 1998, the Smelter Respondents submitted the final report for the Phase I time-critical removal activities at the MMI Facility. The Smelter Respondents performed the following actions:
  - a. Analyzed and mapped all waste materials and contamination for removal purposes, delineating the location of all waste materials and the extent of contaminant toxicity and potential for migration;
  - b. Secured the MMI Facility against trespassers through the use of fences, signs and other devices, as deemed necessary;
  - c. Excavated, demolished, consolidated and removed highly contaminated buildings, structures, soils, loose waste materials, loose industrial by-products, construction materials, demolition debris, machinery, garbage, dusts, post-industrial debris and office or industrial equipment;
  - d. Removed drums, barrels, tanks, and other bulk containers that contained hazardous substances or pollutants or contaminants; and

- e. Contained, treated, disposed and incinerated hazardous materials.

Removal activities involved characterizing and removing non-hazardous materials and removing or treating and disposing of hazardous materials. During the course of this project the Smelter Respondents' contractor handled 4,800 cubic yards of solid non-hazardous waste; 500 cubic yards of brick/concrete special waste; 21 tons of asbestos containing material; 1,160 cubic yards of K069, D006, D008 waste; 3,600 cubic yards of chromium trioxide; and over 200 bottles of laboratory chemicals. Over 3,000 gallons of liquid wastes were characterized through the course of this removal.

The result of this time-critical removal action was that all highly contaminated structures were demolished; hazardous materials were characterized and disposed of accordingly; and the MMI Facility was secured to prevent unauthorized entry.

45. On November 23, 1998, the Smelter Respondents submitted the final EE/CA report for the Master Metals Site for U.S. EPA's approval. The Smelter Order Phase II involved completing an EE/CA Report outlining alternative response actions in accordance with the Statement of Work (SOW) attached to the Smelter Order. This SOW required completion of the following tasks:

1. EE/CA Work Plan
2. EE/CA Support Sampling Plan
3. EE/CA Support Sampling
4. EE/CA Data Report
5. EE/CA and Report

46. On November 23, 1998, U.S. EPA reviewed and submitted comments on the revised risk assessment and derivation of the risk based remediation goal for lead documented in the November 23, 1998, Revised EE/CA for the Master Metals Site.

47. On December 10, 1998, U.S. EPA and the Ohio EPA reviewed the revised EE/CA, dated November 23, 1998, for the Master Metals Site. U.S. EPA considered the EE/CA complete and approved it.

48. On February 23, 1999, U.S. EPA submitted a notice of a public comment period on the EE/CA for the clean-up of lead contaminated soils at the MMI Facility, and notice of a March 18, 1999, public meeting on that subject, for

publication in the Cleveland Plain Dealer. U.S. EPA's recommended alternative included:

- a. Excavation of off-site contaminated soils;
  - b. Consolidation of contaminated soils on site;
  - c. Cover of contaminated areas with two feet of clean fill and revegetation;
  - d. Operation and maintenance of the cover for 30 years; and
  - e. Deed restrictions to minimize potential exposure to contaminated soil.
49. In March 1999, U.S. EPA released a fact sheet to the citizens of Cleveland and interested stakeholders regarding the EE/CA and U.S. EPA's proposed clean-up plan.
50. On March 18, 1999, U.S. EPA conducted a public meeting regarding the EE/CA and U.S. EPA's proposed clean-up plan. The transcript of the public meeting is in the Administrative Record.
51. On March 31, 1999, U.S. EPA extended the public comment period regarding the EE/CA and U. S. EPA's proposed clean-up plan, for an additional 30 days.
52. In April 1999, U.S. EPA approved the final community involvement plan for the MMI Facility.
53. On May 6, 1999, Ohio EPA approved the City of Cleveland's request for an Urban Setting Designation for the "Industrial Valley Area" within the City of Cleveland. This area includes the Master Metals Site, in the event it is eligible for Ohio EPA's Voluntary Action Program.
54. On August 19, 1999, U. S. EPA identified the community in the area of the MMI Facility as an environmental justice (EJ) area, with the percentage of low income or minority residents greater than or equal to two times the state average. Region 5's EJ criteria percentages for the State of Ohio are a minority population of 13% or greater and a low income population of 60% or greater. In the area near the MMI facility, 26% of the population is minority and 74.2% is low income.

55. On September 30, 1999, U.S. EPA signed an Action Memorandum for a non-time-critical removal action at the MMI Facility.
56. On April 12, 2000, NL surveyed the MMI Facility to facilitate redevelopment by prospective purchasers Bredt-Zanick, LLC and the Northern Ohio Lumber and Timber Company ("NOLTCO") (together the "Prospective Purchasers").
57. On September 22, 2000, U.S. EPA issued a contingent amended Action Memorandum, which changed the project scope from a soil cover cap to an asphalt cap. U.S. EPA did this to accommodate the Prospective Purchasers' planned redevelopment of the MMI Facility.
58. On May 8, 2001, the Prospective Purchaser Agreement ("PPA") with the Prospective Purchasers became effective. That PPA requires the prospective purchasers to undertake all operation and maintenance for the MMI Facility. Therefore, the prospective purchasers are Limited Respondents for Operation and Maintenance Only. As such, the Prospective Purchasers' only obligation of this Administrative Order is to perform operation and maintenance and to comply with the access and institutional control requirements of Section V. The Limited Respondents for Operation and Maintenance Only shall have no other obligations under this Order, including, but not limited to the obligation to pay costs under Section VII of this Administrative Order.

#### IV. CONCLUSIONS OF LAW AND DETERMINATIONS

Based on the Findings of Fact set forth above, and the Administrative Record supporting these removal actions, U.S. EPA has determined that:

1. The MMI Facility is a "facility" as defined by Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).
2. Lead, cadmium, chromium, barium and nickel are "hazardous substances" as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).
3. Each Respondent is a "person" as defined by Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).
4. All Respondents are either persons who at the time of disposal of any hazardous substances owned or operated the

MMI Facility, or who arranged for disposal or treatment or transport for disposal or treatment of hazardous substances at the MMI Facility. Each Respondent therefore is liable under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

5. The Prospective Purchasers are Limited Respondents for Operation and Maintenance Only, and their only obligations under this Order are to complete the operation and maintenance required by the approved Operation and Maintenance Work Plan discussed in section 2.4 below, Task 6 of the SOW, and Section V of the PPA.
6. The conditions described in the Findings of Fact above constitute an actual or threatened "release" of a hazardous substance from the facility into the "environment" as defined by Sections 101(8) and (22) of CERCLA, 42 U.S.C. §§ 9601(8) and (22).
7. The conditions present at the MMI Facility constitute a threat to public health, welfare, or the environment based upon the factors set forth in Section 300.415(b)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan, as amended ("NCP"), 40 C.F.R. § 300.415(b)(2). These factors include, but are not limited to, the following:
  - a. Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants or contaminants; this factor is present at the MMI Facility due to the existence of lead contaminated soils.
  - b. High levels of hazardous substances or pollutants or contaminants in soils are largely at or near the surface, that may migrate; this factor is present at the MMI Facility due to the existence of lead contaminated soils.
8. The actual or threatened release of hazardous substances from the MMI Facility may present an imminent and substantial endangerment to the public health, welfare, or the environment within the meaning of Section 106(a) of CERCLA, 42 U.S.C. § 9606(a).
9. The removal actions required by this Order, if properly performed under the terms of this Order, are consistent with the NCP. The removal actions required by this Order are necessary to protect the public health, welfare, or the environment.



**V. ORDER**

Based upon the foregoing Findings of Fact, Conclusions of Law and Determinations, it is hereby ordered and agreed that Respondents will comply with the following provisions, including but not limited to all documents attached to or incorporated into this Order, and perform the following actions:

1. Designation of Contractor, Project Coordinator, and Remedial Project Manager

Respondents will perform the removal actions required by this Order themselves, or retain one or more contractors to implement the removal actions. Respondents will notify U.S. EPA of Respondents' qualifications or the name and qualifications of such contractor(s), whichever is applicable, within five business days of the effective date of this Order. Respondents will also notify U.S. EPA of the name and qualifications of any other contractors or subcontractors retained to perform work under this Order at least five business days prior to commencement of such work. U.S. EPA retains the right to disapprove of the Respondents or any of the contractors and/or subcontractors retained by the Respondents. If U.S. EPA disapproves a selected contractor, Respondents will retain a different contractor within two business days following U.S. EPA's disapproval and will notify U.S. EPA of that contractor's name and qualifications within three business days of U.S. EPA's disapproval.

Within five business days after the effective date of this Order, the Respondents will designate a Project Coordinator who will be responsible for administration of all the Respondents' actions required by the Order. Respondents will submit the designated coordinator's name, address, telephone number, and qualifications to U.S. EPA. To the greatest extent possible, the Project Coordinator will be present on-site or readily available during site work. U.S. EPA retains the right to disapprove of any Project Coordinator named by the Respondents. If U.S. EPA disapproves a selected Project Coordinator, Respondents will retain a different Project Coordinator within three business days following U.S. EPA's disapproval and will notify U.S. EPA of that person's name and qualifications within four business days of U.S. EPA's disapproval. Receipt by Respondents' Project Coordinator of any notice or communication from U.S. EPA relating to this Order will constitute receipt by all Respondents.

The U.S. EPA has designated Gwendolyn Massenburg of the Remedial Response Branch, Region V, as its Remedial Project Manager ("RPM"). Respondents will direct all submissions

required by this Order to the RPM at 77 West Jackson Boulevard, SR-6J, Chicago, Illinois, 60604-3590, by certified or express mail. Respondents will also send a copy of all submissions to Susan Prout, Associate Regional Counsel, 77 West Jackson Boulevard, C-14J, Chicago, Illinois, 60604-3590, and to the Ohio EPA, attention: Sheila Abraham, Division of Emergency and Remedial Response, 2110 East Aurora Road, Twinsburg, OH 44087. All Respondents are encouraged to make their submissions to U.S. EPA on recycled paper (which includes significant post consumer waste paper content where possible) and using two-sided copies.

U.S. EPA and Respondents will have the right, subject to the immediately preceding paragraph, to change their designated Project Coordinator, RPM or Project Counsel. U.S. EPA will notify the Respondents, and Respondents will notify U.S. EPA, as early as possible before such a change is made, but in no case less than twenty four hours before such a change. The initial notification may be made orally but it will be promptly followed by a written notice.

## 2. Work to Be Performed

Respondents will perform the actions set forth below.

Respondents will perform, at a minimum, the following removal actions:

1. Remove site fencing.
2. Excavate perimeter soil (eastern, western, and southern boundary) that contains lead that exceeds a concentration of 1000mg/kg (ppm) or until the historic slag is reached to reduce the likelihood of human, animal or food chain exposure.
3. Conduct a treatability study of all material excavated to determine if treatment of this material is a viable option. Treatment of this material is required when the excavated soil does not pass TCLP. Respondents will provide a copy of the treatability study to U. S. EPA prior to consolidation of the soils. See Section 1.1 of the Statement of Work for treatment of the excavated soils.
4. Perform treatment (if necessary) in secondary containers or cans using the lead stabilization process. Treatment will satisfy the Land Disposal Restriction prior to

consolidation. See section 1.1 of the Statement of Work for treatment requirements. Respondents will submit a post-treatment report to U.S. EPA prior to consolidating the material on site.

5. Backfill all areas excavated or sub-graded areas to grade with clean soil. The existing property lines will serve as center and highest elevation point of the graded slope.
6. Consolidate excavated treated soils and Holmden Properties treated soils on-site, underneath an impermeable geomembrane, or appropriately dispose of the material in a hazardous waste landfill or in a solid waste landfill.
7. The site must be capped with the asphalt cover system, engineered (with the necessary thickness and load-bearing capacity) to permit appropriate reuse, as specified in the SOW.
8. Provide specifics on the cover system and on the areas under the cover system (including a cross section and designation of the areas where the treated soils will be placed) in the remedial design plan for U.S. EPA and Ohio EPA approval.
9. Repair or recondition the cracked concrete (defined as fully penetrating the existing concrete surfaces with a width greater than 1/4 inch) portions of the MMI Facility by sealing the cracks followed by scarification or encapsulation of the concrete surface.
10. Eliminate dangers associated with open pits and sumps on the MMI Facility.
11. Replace the fence on the MMI Facility as specified in the SOW.
12. Perform required operation and maintenance as required for the next thirty years. The particular obligations of the Respondents and the Limited Respondent for Operation and Maintenance Only are set forth in Section V.2.4 below.

## 2.1 Work Plan and Implementation

Attached to this Order for the Respondents to follow is a Statement of Work.

Within sixty business days after the effective date of this Order, the Respondents will submit to U.S. EPA for approval, a draft Work Plan for performing the removal activities set forth above. The draft Work Plan will provide a description of, and an expeditious schedule for, the actions required by this Order.

U.S. EPA may approve, disapprove, require revisions to, or modify the draft Work Plan. If U.S. EPA requires revisions, Respondents will submit a revised draft Work Plan within seven business days of receipt of U.S. EPA's notification of required revisions. Respondents will implement the Work Plan as finally approved in writing by U.S. EPA in accordance with the schedule approved by U.S. EPA. Once approved, or approved with modifications, the Work Plan, the schedule, and any subsequent modifications will be fully enforceable under this Order. Respondents will notify U.S. EPA at least forty eight hours prior to performing any on-site work pursuant to the U.S. EPA approved Work Plan. Respondents will not commence or undertake any removal actions at the Site without prior U.S. EPA approval.

## 2.2 Health and Safety Plan

Within thirty business days after the effective date of this Order, the Respondents will submit for U.S. EPA review and comment a plan that ensures the protection of the public health and safety during the performance of on-site work under this Order. This plan will comply with applicable Occupational Safety and Health Administration ("OSHA") regulations found at 29 C.F.R. Part 1910. If U.S. EPA determines it is appropriate, the plan will also include contingency planning. Respondents will incorporate all changes to the plan recommended by U.S. EPA, and implement the plan during the pendency of the removal action.

## 2.3 Quality Assurance and Sampling

All sampling and analysis performed pursuant to this Order will conform to U.S. EPA direction, approval, and guidance regarding sampling, quality assurance/quality control ("QA/QC"), data validation, and chain of custody procedures. Respondents will ensure that the laboratory used to perform the analysis participates in a QA/QC program that complies with U.S. EPA guidance.

Upon request by U.S. EPA, Respondents will have such a laboratory analyze samples submitted by U.S. EPA for quality assurance monitoring. Respondents will provide to U.S. EPA the quality assurance/quality control procedures followed by all sampling teams and laboratories performing data collection and/or analysis. Respondents will also ensure provision of analytical tracking information consistent with OSWER Directive No. 9240.0-2B, "Extending the Tracking of Analytical Services to PRP-Lead Superfund Sites."

Upon request by U.S. EPA, Respondents will allow U.S. EPA or its authorized representatives to take split and/or duplicate samples of any samples collected by Respondents or their contractors or agents while performing work under this Order. Respondents will notify U.S. EPA not less than three business days in advance of any sample collection activity. U.S. EPA will have the right to take any additional samples that it deems necessary.

#### 2.4 Post-Removal Site Control/Operation and Maintenance

1. In accordance with the Work Plan schedule, or as otherwise directed by the RPM, Respondents will submit a proposal for post-removal site control, consistent with Section 300.415(l) of the NCP, 40 C.F.R. §300.415(l), and OSWER Directive 9360.2-02. The Limited Respondents for Operation and Maintenance Only, are primarily responsible for completing the post-removal site control and Operation and Maintenance of the MMI Facility. The Respondents are secondarily responsible for operation and maintenance, except that they are not responsible for maintaining the cover system under any circumstances.
- b. By no later than 30 days after the effective date of this Order, Respondents will also make a payment to U.S. EPA of \$9600 to satisfy their obligation to perform Operation and Maintenance of the cover system. Respondents will comply with the requirements of Section VII.c in making this payment, except that payment will be due on the date specified herein.
- c. Respondents and Limited Respondents for Operation and Maintenance Only will provide U.S. EPA with documentation of all post-removal site control arrangements.

### 5 Reporting

Respondents will submit a monthly written progress report to U.S. EPA concerning actions undertaken pursuant to this Order, beginning the 10<sup>th</sup> day of each month following the date of U.S. EPA's approval of the Work Plan, until termination of this Order, unless otherwise directed in writing by the RPM. These reports will describe all significant developments during the preceding period, including the work performed and any problems encountered, analytical data received during the reporting period, and developments anticipated during the next reporting period, including a schedule of work to be performed, anticipated problems, and planned resolutions of past or anticipated problems.

Any Respondent that owns any portion of the Site will, at least thirty days prior to the conveyance of any interest in real property at the Site, give written notice of this Order to the transferee and written notice of the proposed conveyance to U.S. EPA and the State. The notice to U.S. EPA and the State will include the name and address of the transferee. The party conveying such an interest will require that the transferee will provide access as described in Section V.3 (Access to Property and Information).

### 2. Final Report

Within sixty calendar days after completion of all removal actions required under this Order, the Respondents will submit for U.S. EPA review a final report summarizing the actions taken to comply with this Order. The final report will conform to the requirements set forth in Section 300.165 of the NCP, 40 C.F.R. §300.165. The final report will also include a good faith estimate of total costs incurred in complying with the Order, a listing of quantities and types of materials removed off-site or handled on-site, a discussion of removal and disposal options considered for those materials, a listing of the ultimate destinations of those materials, a presentation of the analytical results of all sampling and analyses performed, and accompanying appendices containing all relevant documentation generated during the removal action (e.g., manifests, invoices, bills, contracts, and permits).

The final report will also include the following certification signed by a person who supervised or directed the preparation of that report:

Under penalty of law, I certify that, to the best of my knowledge, after appropriate inquiries of all

U.S. EPA that such documents and information are available to U.S. EPA for inspection, and upon request, will provide the originals or copies of such documents and information to U.S. EPA. In addition, Respondents will provide documents and information retained under this Section at any time before expiration of the six year period at the written request of U.S. EPA. Any information that Respondents are required to provide or maintain pursuant to this Order is not subject to the Paperwork Reduction Act of 1995, 44 U.S.C. §3501 et seq.

5. Off-Site Shipments

All hazardous substances, pollutants or contaminants removed off-site pursuant to this Order for treatment, storage or disposal will be treated, stored, or disposed of at a facility in compliance, as determined by U.S. EPA, with the U.S. EPA Off-Site Rule, 40 C.F.R. §300.440, 58 Fed. Reg. 49215 (Sept. 22, 1993).

6. Compliance With Other Laws

Respondents will perform all actions required pursuant to this Order in accordance with all applicable local, state, and federal laws and regulations except as provided in Section 121(e) of CERCLA, 42 U.S.C. §9621(e), and 40 C.F.R. §300.415(j). In accordance with 40 C.F.R. §300.415(j), all on-site actions required pursuant to this Order will, to the extent practicable, as determined by U.S. EPA, considering the exigencies of the situation, attain applicable or relevant and appropriate requirements under federal environmental or state environmental or facility siting laws.

7. Emergency Response and Notification of Releases

If any incident, or change in Site conditions, during the activities conducted pursuant to this Order causes or threatens to cause an additional release of hazardous substances from the MMI Facility or an endangerment to the public health, welfare, or the environment, the Respondents will immediately take all appropriate action to prevent, abate or minimize such release or endangerment caused or threatened by the release. Respondents will also immediately notify the RPM or, in the event of his/her unavailability, will notify the Regional Duty Officer, Emergency Response Branch, Region V at (312) 353-2318, of the incident or Site conditions. If Respondents fail to respond, U.S. EPA may respond to the release or endangerment and reserve the right to recover costs associated with that response.

Respondents will submit a written report to U.S. EPA within seven business days after each release, setting forth the events that occurred and the measures taken or to be taken to mitigate any release or endangerment caused or threatened by the release and to prevent the reoccurrence of such a release. Respondents will also comply with any other notification requirements, including those in Section 103 of CERCLA, 42 U.S.C. §9603, and Section 304 of the Emergency Planning and Community Right-To-Know Act, 42 U.S.C. §11004.

#### 8. Institutional Controls

a. If any property where land/water use restrictions are needed to implement this Order is owned or controlled by persons other than any of the Respondents or Limited Respondents for Operation and Maintenance Only, Respondents shall use best efforts to secure from such persons an agreement, enforceable by Respondents, Limited Respondents for Operation and Maintenance Only, and U.S. EPA to refrain from using such property in any manner that would interfere with or adversely affect the integrity or protectiveness of the actions to be implemented pursuant to this Order. Similarly, commencing on the effective date of this Order, Respondents and Limited Respondents for Operation and Maintenance Only also agree to refrain from using the MMI Facility in any manner that would interfere with or adversely affect the integrity or protectiveness of the actions to be implemented pursuant to this Order. Such restrictions include, but are not limited to,

1. Well construction: no person may construct or reconstruct a well on the property without:
  - (a) notifying U.S. EPA and Ohio EPA;
  - (b) determining what specific prohibitions or requirements are applicable to the well;
  - (c) obtaining approval from all relevant authorities and U.S. EPA prior to the construction or reconstruction; and
  - (d) complying with all requirements applicable to the well.
2. Drilling into the cover system: no person may drill or puncture the cover system on the property without:



- (a) notifying U.S. EPA and Ohio EPA;
- (b) determining what specific prohibitions or requirements are applicable to the asphalt cover;
- (c) obtaining approval from all relevant authorities and U.S. EPA prior to the drilling; and
- (d) maintaining the protectiveness of the asphalt cover.

3. Restricted activities: no person may undertake the following activities without written permission from U.S. EPA:

- (a) excavating or grading of any portion of the land surface within the current fence line;
- (b) filling in the capped area;
- (c) constructing or installing a building or other structures with a foundation that would sit on or be placed within the cap or cover; or
- (d) using of groundwater for drinking purposes.

b. With respect to the MMI Facility, Limited Respondents for Operation and Maintenance Only will execute and record in the Recorder's Office of Cuyahoga County, State of Ohio, an easement, running with the land, that (i) grants a right of access as set forth at Section V.3 of this Order, above; and (ii) grants the right to enforce the land/water use restrictions listed in Section V.8 of this Order, or other restrictions, that U.S. EPA determines are necessary to implement, ensure non-interference with, or ensure the protectiveness of the actions to be performed pursuant to this Order. The rights to enforce land/water use restrictions shall be granted to one or more of the following persons, as determined by U.S. EPA: (i) the United States, on behalf of EPA, and its representatives, (ii) the State and its representatives, (iii) the Respondents and their representatives, and/or (iv) other appropriate grantees. Within forty-five days of entry of this Order, the Limited Respondents for Operation and Maintenance Only shall submit to U.S. EPA for review and approval with respect to the MMI Facility:

- 1. A draft easement enforceable under the laws of the State of Ohio, free and clear of all prior liens and encumbrances (except as approved by U.S. EPA), and acceptable under the

Attorney General's Title Regulations promulgated pursuant to 40 U.S.C. § 255; and

2. A current title commitment or report prepared in accordance with the U.S. Department of Justice Standards for the Preparation of Title Evidence in Land Acquisitions by the United States (1970) (the "Standards").

Within fifteen days of EPA's approval and acceptance of the easement, Limited Respondents for Operation and Maintenance Only shall update the title search and, if it is determined that nothing has occurred since the effective date of the commitment or report to affect the title adversely, the easement shall be recorded with the Recorder's Office of Cuyahoga County. Within thirty days of the recording of the easement, the Limited Respondents for Operation and Maintenance Only shall provide EPA with final title evidence acceptable under the Standards, and a certified copy of the original recorded easement showing the clerk's recording stamps.

c. With respect to property that is owned or controlled by persons other than Limited Respondents for Operation and Maintenance Only but for which land/water use restrictions are needed, Respondents shall be responsible for implementing the requirements of Section V.8.b. Respondents will immediately notify U.S. EPA if, after using best efforts, they are unable to obtain an agreement regarding land/water use restrictions. Respondents will describe in writing their efforts to obtain such agreement. Upon written request, U.S. EPA may then assist Respondents in obtaining such restrictions or easements. Respondents will reimburse U.S. EPA for all costs and attorneys' fees incurred by the United States in obtaining such restrictions or easements.

d. If U.S. EPA determines that land/water use restrictions in the form of state or local laws, regulations, ordinances or other governmental controls are needed to implement this Order's actions, ensure the integrity and protectiveness thereof, or ensure non-interference therewith, Limited Respondents for Operation and Maintenance Only shall cooperate with U.S. EPA's efforts to secure such governmental controls.

#### **VI. AUTHORITY OF THE U.S. EPA REMEDIAL PROJECT MANAGER**

The Remedial Project Manager (RPM) will be responsible for overseeing the implementation of this Order. The RPM will have the authority vested in an RPM by the NCP, including the authority to halt, conduct, or direct any work required by this Order, or to

direct any other response action undertaken by U.S. EPA or Respondents at the Site. Absence of the RPM from the MMI Facility will not be cause for stoppage of work unless specifically directed by the RPM.

## VII. REIMBURSEMENT OF COSTS

a. By no later than thirty days after the Effective Date of this Order, Respondents will pay to U.S. EPA \$62,760 in settlement of all costs that have accrued through January 31, 2001. Respondents will comply with the requirements of Section VII.c below in making this payment, except that payment will be due on the date specified in this Section VII.a.

b. U.S. EPA will send Respondents a bill for "oversight costs" on an annual basis, such bill to include an Itemized Cost Summary. "Oversight costs" are all costs, including, but not limited to, direct and indirect costs, that the United States incurs in reviewing or developing plans, reports and other items pursuant to this AOC. "Oversight costs" will also include all costs, including direct and indirect costs, incurred by the United States in connection with the Site starting from February 1, 2001.

c. Respondents will, within thirty calendar days of receipt of a bill, remit a cashier's or certified check for the amount of the bill made payable to the "Hazardous Substance Superfund," to the following address:

U.S. Environmental Protection Agency  
Program Accounting & Analysis Section  
P.O. Box 70753  
Chicago, Illinois 60673

Respondents will simultaneously transmit a copy of the check to the Director, Superfund Division, U.S. EPA Region 5, 77 West Jackson Blvd., Chicago, Illinois, 60604-3590. Payments will be designated as "Response Costs - Master Metals Cleveland Site" and will reference:

the payer's name and address;

the U.S. EPA site identification number 05WB; and

the docket number of this Order.

d. In the event that any payment is not made within the deadlines described above, Respondents will pay interest on the

unpaid balance. Interest is established at the rate specified in Section 107(a) of CERCLA, 42 U.S.C. §9607(a). The interest will begin to accrue on the date of the Respondents' receipt of the bill (or for the \$62,760 due under this Order, thirty days after the effective date of this Order). Interest will accrue at the rate specified through the date of the payment. Payments of interest made under this paragraph will be in addition to such other remedies or sanctions available to the United States by virtue of Respondents' failure to make timely payments under this Section.

Respondents may dispute all or part of a bill for Oversight costs submitted under this Order, if Respondents allege that U.S. EPA has made an accounting error, or if Respondents allege that a cost item is inconsistent with the NCP.

If any dispute over costs is resolved before payment is due, the amount due will be adjusted as necessary. If the dispute is not resolved before payment is due, Respondents will pay the full amount of the uncontested costs into the Hazardous Substance Fund as specified above on or before the due date. Within the same time period, Respondents will pay the full amount of the contested costs into an interest-bearing escrow account. Respondents will simultaneously transmit a copy of both checks to the RPM. Respondents will ensure that the prevailing party or parties in the dispute will receive the amount upon which they prevailed from the escrow funds plus interest within twenty calendar days after the dispute is resolved.

#### **VIII. DISPUTE RESOLUTION**

The parties to this Order will attempt to resolve, expeditiously and informally, any disagreements concerning this Order.

If the Respondents object to any U.S. EPA action taken pursuant to this Order, including billings for oversight costs, the Respondents will notify U.S. EPA in writing of their objections within ten calendar days of such action, unless the objections have been informally resolved. This written notice will include a statement of the issues in dispute, the relevant facts upon which the dispute is based, all factual data, analysis or opinion supporting Respondents' position, and all supporting documentation on which such party relies. U.S. EPA will submit its Statement of Position, including supporting documentation, no later than ten calendar days after receipt of the written notice of dispute. In the event that these ten-day time periods for exchange of written documents may cause a delay in the work, they will be shortened upon, and in accordance with, notice by U.S. EPA. The time periods for exchange of written documents

relating to disputes over billings for oversight costs may be extended at the sole discretion of U.S. EPA.

An administrative record of any dispute under this Section will be maintained by U.S. EPA. The record will include the written notification of such dispute, and the Statement of Position served pursuant to the preceding paragraph. Upon review of the administrative record, the Director of the Superfund Division, U.S. EPA Region V, will resolve the dispute consistent with the NCP and the terms of this Order.

Respondents' obligations under this Order will not be tolled by submission of any objection for dispute resolution under this Section. Following resolution of the dispute, as provided by this Section, Respondents will fulfill the requirement that was the subject of the dispute in accordance with the agreement reached or with U.S. EPA's decision, whichever occurs.

#### **IX. FORCE MAJEURE**

Respondents agree to perform all requirements under this Order within the time limits established under this Order, unless the performance is delayed by a force majeure. For purposes of this Order, a force majeure is defined as any event arising from causes beyond the control of Respondents or of any entity controlled by Respondents, including but not limited to their contractors and subcontractors, that delays or prevents performance of any obligation under this Order despite Respondents' best efforts to fulfill the obligation. Force majeure does not include financial inability to complete the work or increased cost of performance.

Respondents will notify U.S. EPA orally within twenty-four hours after Respondents become aware of any event that Respondents contend constitutes a force majeure, and in writing within seven calendar days after the event. Such notice will: identify the event causing the delay or anticipated delay; estimate the anticipated length of delay, including necessary demobilization and re-mobilization; state the measures taken or to be taken to minimize the delay; and estimate the timetable for implementation of the measures. Respondents will take all reasonable measures to avoid and minimize the delay. Failure to comply with the notice provision of this Section will be grounds for U.S. EPA to deny Respondents an extension of time for performance. Respondents will have the burden of demonstrating by a preponderance of the evidence that the event is a force majeure, that the delay is warranted under the circumstances, and that best efforts were exercised to avoid and mitigate the effects of the delay.

If U.S. EPA determines a delay in performance of a requirement under this Order is or was attributable to a force majeure, the time period for performance of that requirement will be extended as deemed necessary by U.S. EPA. Such an extension will not alter Respondents' obligation to perform or complete other tasks required by the Order which are not directly affected by the force majeure.

#### **X. STIPULATED AND STATUTORY PENALTIES**

For each day, or portion thereof, that Respondents fail to fully perform any requirement of this Order in accordance with the schedule established pursuant to this Order, Respondents will be liable as follows:

<u>Deliverable/Activity</u>	<u>Penalty For Days 1-7</u>	<u>Penalty For More Than 7 Days</u>
Failure to Submit a Draft or Revised Work Plan	\$750/Day	\$2,000/Day
Late Submittal of Progress Reports or Other Miscellaneous Reports/Submittals	\$200/Day	\$500/Day
Failure to Meet any Scheduled Deadline in the Order	\$200/Day	\$500/Day
Failure to Meet of the Operation and Maintenance Requirements, if applicable	\$200/Day	\$500/Day

Upon receipt of written demand by U.S. EPA, Respondents will make payment to U.S. EPA within twenty days and interest will accrue on late payments in accordance with Section VII of this Order (Reimbursement of Costs).

Even if violations are simultaneous, separate penalties will accrue for separate violations of this Order. Penalties accrue and are assessed per violation per day. Penalties will accrue regardless of whether EPA has notified Respondents of a violation or act of noncompliance. The payment of penalties will not alter in any way Respondents' obligations to complete the performance of

the work required under this Order. Stipulated penalties will accrue, but need not be paid, during any dispute resolution period concerning the particular penalties at issue. If Respondents prevail upon resolution, Respondents will pay only such penalties as the resolution requires. In its unreviewable discretion, U.S. EPA may waive its rights to demand all or a portion of the stipulated penalties due under this Section. Such a waiver must be made in writing.

Violation of any provision of this Order may subject Respondents to civil penalties of up to \$27,500 per violation per day, as provided in Section 106(b)(1) of CERCLA, 42 U.S.C. §9606(b)(1). Respondents may also be subject to punitive damages in an amount up to three times the amount of any cost incurred by the United States as a result of such violation, as provided in Section 107(c)(3) of CERCLA, 42 U.S.C. §9607(c)(3). Should Respondents violate this Order or any portion hereof, U.S. EPA may carry out the required actions unilaterally, pursuant to Section 104 of CERCLA, 42 U.S.C. §9604, and/or may seek judicial enforcement of this Order pursuant to Section 106 of CERCLA, 42 U.S.C. §9606.

#### **XI. RESERVATION OF RIGHTS**

Except as specifically provided in this Order, nothing herein will limit the power and authority of U.S. EPA or the United States to take, direct, or order all actions necessary to protect public health, welfare, or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants or contaminants, or hazardous or solid waste on, at, or from the Site. Further, nothing herein will prevent U.S. EPA from seeking legal or equitable relief to enforce the terms of this Order. U.S. EPA also reserves the right to take any other legal or equitable action as it deems appropriate and necessary, or to require the Respondents in the future to perform additional activities pursuant to CERCLA or any other applicable law. Except as specifically provided in this Order, Respondents reserve the right to assert any factual or legal position in any action taken by U.S. EPA or the United States under this Article XI.

**XII. OTHER CLAIMS**

By issuance of this Order, the United States and U.S. EPA assume no liability for injuries or damages to persons or property resulting from any acts or omissions of Respondents. The United States or U.S. EPA will not be a party or be held out as a party to any contract entered into by the Respondents or their directors, officers, employees, agents, successors, representatives, assigns, contractors, or consultants in carrying out activities pursuant to this Order. Each party will bear its own costs and attorneys fees in connection with the action resolved by this Order.

Except as expressly provided in Section XIII (Covenant Not To Sue), nothing in this Order constitutes a satisfaction of or release from any claim or cause of action against the Respondents or any person not a party to this Order, for any liability such person may have under CERCLA, other statutes, or the common law, including but not limited to any claims of the United States for costs, damages and interest under Sections 106(a) or 107(a) of CERCLA, 42 U.S.C. §§9606(a), 9607(a).

This Order does not constitute a preauthorization of funds under Section 111(a)(2) of CERCLA, 42 U.S.C. §9611(a)(2). The Respondents waive any claim to payment under Sections 106(b), 111, and 112 of CERCLA, 42 U.S.C. §§9606(b), 9611, and 9612, against the United States or the Hazardous Substance Superfund arising out of any action performed under this Order. No action or decision by U.S. EPA pursuant to this Order will give rise to any right to judicial review except as set forth in Section 113(h) of CERCLA, 42 U.S.C. §9613(h).

**XIII. COVENANT NOT TO SUE**

Except as otherwise specifically provided in this Order, upon issuance of the U.S. EPA notice referred to in Section XVII (Notice of Completion), U.S. EPA covenants not to sue Respondents for judicial imposition of damages or civil penalties or to take administrative action against Respondents for any failure to perform removal actions agreed to in this Order except as otherwise reserved herein.

Except as otherwise specifically provided in this Order, in consideration and upon Respondents' payment of the response costs specified in Section VII of this Order, U.S. EPA covenants not to sue or to take administrative action against Respondents under Section 107(a) of CERCLA, 42 U.S.C. §9607(a), for recovery of past and oversight costs incurred by the United States in connection



with this removal action and this Order. This covenant not to sue will take effect upon the receipt by U.S. EPA of the payments required by Section VII (Reimbursement of Costs).

These covenants not to sue are conditioned upon the complete and satisfactory performance by Respondents of their obligations under this Order. These covenants not to sue extend only to the Respondents and do not extend to any other person.

#### **XIV. CONTRIBUTION PROTECTION**

With regard to claims for contribution against Respondents for matters addressed in this Order, the Parties hereto agree that the Respondents are entitled to protection from contribution actions or claims to the extent provided by Section 113(f)(2) and 122(h)(4) of CERCLA, 42 U.S.C. §§9613(f)(2) and 9622(h)(4).

Nothing in this Order precludes Parties from asserting any claims, causes of action or demands against any persons not parties to this Order for indemnification, contribution, or cost recovery.

#### **XV. INDEMNIFICATION**

Respondents agree to indemnify, save and hold harmless the United States, its officials, agents, contractors, subcontractors, employees and representatives from any and all claims or causes of action: (A) arising from, or on account of, acts or omissions of Respondents and Respondents' officers, heirs, directors, employees, agents, contractors, subcontractors, receivers, trustees, successors or assigns, in carrying out actions pursuant to this Order; and (B) for damages or reimbursement arising from or on account of any contract, agreement, or arrangement between (any one or more of) Respondents, and any persons for performance of work on or relating to the Site, including claims on account of construction delays. Nothing in this Order, however, requires indemnification by Respondents for any claim or cause of action against the United States based on negligent action taken solely and directly by U.S. EPA (not including oversight or approval of plans or activities of the Respondents).

#### **XVI. MODIFICATIONS**

Modifications to any plan or schedule may be made in writing by the RPM or at the RPM's oral direction. If the RPM makes an oral modification, it will be memorialized in writing within 7 business days; however, the effective date of the modification will be the date of the RPM's oral direction. Any other

requirements of this Order may be modified in writing by mutual agreement of the parties.

If Respondents seek permission to deviate from any approved plan or schedule, Respondents' Project Coordinator will submit a written request to U.S. EPA for approval outlining the proposed modification and its basis.

No informal advice, guidance, suggestion, or comment by U.S. EPA regarding reports, plans, specifications, schedules, or any other writing submitted by the Respondents will relieve Respondents of their obligations to obtain such formal approval as may be required by this Order, and to comply with all requirements of this Order unless it is formally modified.

#### **XVII. NOTICE OF COMPLETION**

When U.S. EPA determines, after U.S. EPA's review of the Final Report, that all work has been fully performed in accordance with this Order, except for certain continuing obligations required by this Order (e.g., record retention, payment of costs), U.S. EPA will provide written notice to the Respondents. If U.S. EPA determines that any removal activities have not been completed in accordance with this Order, U.S. EPA will notify the Respondents, provide a list of the deficiencies, and require that Respondents modify the Work Plan if appropriate to correct such deficiencies. The Respondents will implement the modified and approved Work Plan and will submit a modified Final Report in accordance with the U.S. EPA notice. Failure to implement the approved modified Work Plan will be a violation of this Order.

#### **XVIII. SEVERABILITY**

If a court issues an order that invalidates any provision of this Order or finds that Respondents have sufficient cause not to comply with one or more provisions of this Order, Respondents will remain bound to comply with all provisions of this Order not invalidated by the court's order.

#### **XIX. EFFECTIVE DATE**

This Order will be effective upon receipt by NL of a copy of this Order signed by the Director, Superfund Division, U.S. EPA Region V.

IN THE MATTER OF:

Master Metals, Inc.,  
Superfund Site,  
Cleveland, Ohio

SIGNATORIES

Each undersigned representative of a signatory to this Administrative Order on Consent certifies that he or she is fully authorized to enter into the terms and conditions of this Order and to bind such signatory, its successors and assigns, to this document.

Agreed this 31<sup>st</sup> day of July, 2002

By:

David B. Garten  
(Signature)

Name:

Position:

David B. Garten  
Vice President, Secretary  
and General Counsel

Signatory:

N L Industries, Inc.

**Statement of Work  
for the Design/Construction and Clean-up  
at the Master Metals Inc., Superfund Site  
Cuyahoga County, Cleveland, Ohio**

**I. PURPOSE**

The purpose of this Statement of Work (SOW) is to set forth requirements for implementation of the clean up actions set forth in the Change of Project Scope Action Memorandum, which was signed by the Superfund Division Director, U.S. EPA Region 5, September 22, 2000, for the Master Metals Superfund Site ("Site"). The Respondents must follow the Action Memorandum, the SOW, the approved Work Plans, addendum to Work Plan, the approved Clean-Up Work Plans, U.S. EPA Superfund Guidance, and any additional guidance provided by U.S. EPA in submitting deliverables for designing and implementing the clean-up activities at the site.

**II. DESCRIPTION OF THE CLEAN-UP ACTIVITIES/PERFORMANCE STANDARDS**

Respondents must design and implement the non-time critical removal action (NTCRA) to meet the performance standards and specifications set forth in the EE/CA, Action Memorandum, Administrative Order on Consent (AOC), and this SOW. Performance standards must include cleanup standards, standards of control, construction quality criteria and other substantive requirements, criteria or limitations including all identified Applicable or Relevant and Appropriate Requirements (ARARs) set forth in the EE/CA, Action Memorandum, AOC, and this SOW.

The Cleanup Standards required in this SOW are listed in the table below:

CLEANUP LEVELS		
Contaminant of Concern	Soil Cleanup Level	Basis for Soil Cleanup Level
Lead	1,000 mg/kg	risk-based remediation goal (RBRG)

\*NOTE: The cleanup must be confirmed by a demonstration as specified in paragraph 6 of this SOW that the cleanup levels in the above table have been reached and that the levels of the above-listed contaminant remaining at the site fall below the upper bound of the 95% upper confidence limit on the mean of the measured data, evaluated as a function of the contaminant concentrations and receptor populations exposed. Refer to the *Supplemental Guidance to RAGS: Calculating the Concentration Term, OSWER Directive: 9285.7-081, May 1992*.

The response action selected to mitigate threats associated with the Master Metals Site must consist of the following tasks:

**1. Construction, Installation, and Operation of a Containment System for Removal Action**

**1.1 Excavation and Treatment of Contaminated Soil**

The Respondents must excavate and treat all soil that contains lead that exceeds a concentration of 1000mg/kg until the historic slag is encountered. Treatment must involve the lead stabilization process. The Respondents must perform the lead stabilization treatment process in secondary

containers. The Respondents must treat the contaminated soil to meet the following performance standards: Respondents must excavate all soil that is not under the cover system<sup>1</sup> and that exceeds the risk goal for the site (and is not historic slag) and treat that soil to the Land Disposal Restrictions (LDR), Alternative Performance Standards, 40 C.F.R. 268.49(c)(1)(B)(C):

*(c) Treatment standards for contaminated soils. Prior to land disposal, contaminated soil identified as needing to comply with LDRs must be treated according to all the standards specified in this paragraph or according to the Universal Treatment Standards (UTS) specified in 40 C.F.R. 268.48. (1) All soils. Prior to land disposal, all constituents subject to treatment must be treated as follows: (B) For metals, treatment must achieve 90 percent reduction in constituent concentrations as measured in leachate from the treated media (tested according to the TCLP) or 90 percent reduction in total constituent concentrations (when a metal removal treatment technology is used) except as provided by paragraph (c) (1) (C) of this section. (C) When treatment of any constituent subject to treatment to a 90 percent reduction standard would result in a concentration less than 10 times the (UTS) for that constituent, treatment to achieve constituent concentration less than 10 times the UTS is not required.*

After treatment, if necessary, Respondents must consolidate the soil on-site underneath the cover system. Before excavating perimeter soil, workers must clear vegetation and remove the site fence. The Respondents must replace the excavated soils with clean soil, plant the perimeter with new vegetation, and replace the fence. The Respondents should take action to ensure proper drainage to eliminate any run-off onto, or from the site. Respondents must backfill to grade all areas excavated or subgraded on-site.

## 1.2 Containment Cover System

The Respondents must design and construct a containment cover, "cover system" to eliminate the potential for exposure to lead contaminated soils on the site. The following material may be consolidated under the cover: treated material excavated from the perimeter of the site and the treated Holmden Ave soils stockpiled on site, "awaiting ultimate disposal." After consolidation of the material, Respondents must cover the consolidated material with a cap to prevent exposure to the materials, as specified in the removal design/removal action work plan that must be submitted for approval by U. S.EPA.

The Respondents must backfill to grade all areas of the site that have been excavated or are subgraded. Only the most severely deteriorated portions of the site must be placed under the cover system; other areas (under the existing concrete) not covered with the cover system, must be reconditioned by sealing the cracks, followed by scarification or encapsulation of the concrete surface. Specifics on the cover system (including a cross section and designation of the areas where the treated material must be placed) must be provided in the removal design/removal action work plan. The Limited Respondents must conduct routine maintenance of the cover as part of the long term requirements to be established in the Operation and Maintenance (O&M) Plan.

---

<sup>1</sup> This excludes the western perimeter areas excavated during the approved Phase I Time Critical Removal, where the risk goal had been achieved, or the historic slag was encountered. This excluded western portion of the site that is presently below grade needs to be re-graded with clean material and appropriately sloped to prevent potential "run-on" to the site and "run-off" from the site.

Once, Northern Ohio Lumber and Timber Company (NOLTCO) acquires the site, Respondents must place the consolidated treated soils underneath an asphalt cover system, engineered (with the necessary thickness and load-bearing capacity) to permit appropriate reuse. See Section V-2, Remedy Two of the Administrative Order. The Respondents must recondition the other areas of the existing concrete not covered with the asphalt cover system, by sealing the cracks, followed by scarification or encapsulation of the concrete surface. The Respondents must backfill to grade all areas of the site that have been excavated or are subgraded. As specified in the removal design, treated soil, including that from Holmden Properties awaiting "ultimate disposal" may be consolidated under the asphalt for grading purposes. A geotextile membrane must be placed between the treated soil and any clean fill used for grading purposes, as appropriate. Specifics on the cover system (including a cross section and designation of the areas where the treated material must be placed) must be provided in the removal design plan submitted by the Respondents for approval by U. S. EPA.

The Respondents must dispose of excavated soil not consolidated on the site at a hazardous or solid waste disposal facility, as appropriate. The Limited Respondents must conduct routine maintenance of the cover as part of the long term requirements to be established in the Operation and Maintenance (O&M) Plan.

### 1.3 Excavation Locations

The Respondents must excavate all areas not under the cover system or existing concrete surface which exceeds the risk goal for the site (and is not historical slag) and treat that soil to Land Disposal Restrictions (LDR) Alternative Performance Standards, 40 C.F.R. 268.49(c)(1)(B)(C). Specific locations must be determined in the preliminary design studies. All perimeter areas should also be addressed; the extent of the perimeter areas inside and outside the current fence line is specified below.

1.3.1. The extent of the perimeter areas outside the current fence line that do not meet the risk goal for the Site<sup>2</sup> are as follows:

- 1.3.1.1. The eastern perimeter areas extend to the curb of West Third Street. The eastern perimeter areas to be excavated include sample locations "X-1 through X-9".
- 1.3.1.2. The southern perimeter areas extend to the curb of West Third Street. The southern area to be excavated includes sample locations "X-9 through X-13".
- 1.3.1.3. The western perimeter areas extend to where there is visual evidence of the divide between the manufacturing operations of the Master Metals facility and the eastern edge of the adjoining railroad spur. The western perimeter areas to be excavated include sample locations "X-13 through X-19".

---

<sup>2</sup>All sampling locations, grids, and analytical results referenced in Section 1.3.1 are those identified in the November 1998 Master Metals EE/CA.

1.3.2. The extent of the perimeter areas inside the current fence line that do not meet the risk goal for the Site<sup>3</sup> are as follows:

1.3.2.1. The southern perimeter areas excavated during the Phase 1 TCR where sand/gravel was encountered (grids DD1, DD2, FF1, FF2, GG1, GG2 and HH1) need to be excavated until the risk goal for the site is achieved.<sup>4</sup>

1.3.2.2. The western perimeter excavated areas where the grids contained slag need not be further remediated (as the risk goal for the site was met in these areas). The excavated areas where the white sludge was encountered (grids I1, J1, and K1) may need to be addressed to achieve the risk goal for the site, as appropriate.<sup>4</sup>

## **2. Waste Streams**

Other waste streams must be disposed of at an approved landfill. These waste streams include but are not limited to: personnel protective gear; soils/solids resulting from decontamination of equipment, additional investigations, and construction of response systems; and other, not yet anticipated, on-site solid waste streams.

## **3. Post-excavation Sampling Analysis**

Respondents must conduct post-excavation sampling analysis of soils in all excavated areas for documentation of the site conditions before backfilling. A soil analysis must be documented of the soil used for backfilling to be free of contaminants.

## **4. Soil Clean-up Verification Reports**

Soil Clean-up Verification Reports must identify the number of samples and provide the basis for the selection of sample locations, depths, and total numbers such that the site is adequately characterized, post-remediation. The verification report must include the following:

### **4.1. MAPS AND CROSS SECTIONS**

Provide a scaled map of the excavation with sample grid and sample locations identified. Appropriate cross section should depict the stratigraphy, fractures, soil types, and final depth and elevations of the excavation.

### **4.2. SAMPLE LOCATION RATIONALE**

---

<sup>3</sup>Sampling locations/grids are those identified in the October 8, 1997 letter from ENTACT requesting a modification to the Phase I Time Critical Removal (TCR) Work Plan

<sup>4</sup>If sand was used instead of a soil backfill in these areas, this may need to be assessed during the removal design to ascertain if the required load bearing capacity is achieved, in the event of site re-use.

- 4.2.1 Rationale/basis for selection of sample location, depth, sample numbers.
- 4.2.2 Properly label and identify the sampling grid stations (map) including background stations.
- 4.2.3 Sample Depths
- 4.2.4 Sample Collection Procedures.
- 4.2.5 Results of all tests to determine clean closure.

#### **4.3. DATA ANALYSIS**

- 4.3.1 Analytical parameters
- 4.3.2 Analytical methods used.
- 4.3.3 Method detection limits
- 4.3.4 Laboratory Quality Assurance/Quality Control

#### **5. STATISTICAL ANALYSES**

- 5.1 Explanation and calculation of upper bound of 95% confidence interval.
- 5.2 Statistical comparison of sampling results to cleanup levels.
- 5.3 Lab results.

#### **6. Additional information to support closure**

The Respondents must backfill all excavated areas with clean soil to present grade, and design the backfilling with consideration for future site use, as appropriate, and prevention of soil erosion. The Respondents must provide additional information regarding residual risks as a function of the spatial correlation of sample values, for both present and future land uses.

#### **7. Removal and Disposal of General Debris**

During clean-up of the various source areas of the site, general debris and interfering structures must be removed. The Respondents must dispose the removed debris off-site.

#### **8. Site Security**

The Respondents must ensure the site is secure before, during, and after removal activities. All site security which is currently in place must be maintained. This includes replacement of the fence with an industrial grade fence topped with three strands of barb wire.

#### **9. Monitoring and Testing Program for Removal Action**

The parameter which Respondents must analyze for in the monitoring is: lead. The Respondents must implement an air monitoring program to evaluate and ensure the construction and implementation of the clean-up action complies with the approved plans, design documents, and performance standards. Air monitoring must be conducted by the Respondents just prior to commencement of the removal action and during the removal action. The Respondents must use the results of monitoring conducted just before the start of the removal action to establish the baseline (i.e., background) levels. The baseline monitoring must be conducted on a regular basis (minimum four times daily) for a full work week (Monday through



Friday) prior to initiation of excavation or demolition activities.

The Respondents must monitor fugitive air emissions from soil excavation, handling, and backfilling operations. Fugitive particulate at the property boundary locations must be monitored in accordance with the Health and Safety Plan.

The particulate concentrations at the property boundary must not exceed the following action levels without employing particulate control measures. The action level for particulate concentrations is  $187.5 \mu\text{g}/\text{m}^3$ , which is one-half of the 24 hour National Ambient Air Quality Standards (NAAQS) for particulate exposure ( $150 \mu\text{g}/\text{m}^3$ ) converted to an one-hour averaging period. The conversion factor used is 2.5 (1/0.4). However, these action levels are established to determine when mitigation measures are necessary to protect the public. Removal activities should use the best management practices for dust suppression, regardless of the maximum allowable limit, and should include modifying work methods or utilizing engineering controls.

Respondents must use a total of four sampling stations. The air samples must be collected using the General Metal Works Model GPS-1, or sample equivalent. At a minimum, one upwind and two downwind sampling locations must be utilized. As necessary, based upon the complexity of the site removal activities and the magnitude and direction of wind related to the potential off- receptors, a third downwind sample station must be collected. Sampling locations must be established immediately inside the perimeter of the area where the excavation is taking place.

Analytical results must be made available to U. S. EPA in a preliminary form within 5 working days from the receipt of the sample by the approved laboratory.

The public in Cleveland has voiced a high level of concern over activities at this site and has requested to be notified when site cleanup activities begins. Respondents may be called upon by U.S. EPA to either conduct or assist in community relations activities at the Site. Respondents must assist U.S. EPA in community relations upon request from U.S. EPA.

#### **10. Monitoring Well and Borehole Abandonment**

Boreholes that were not completed as monitoring wells and monitoring wells that are no longer being utilized for ground water quality sampling or ground water level measurements must be abandoned properly to ensure public safety. Well/borehole abandonment must consist either of a method for well removal and simultaneous grouting of the borehole with bentonite, neat cement or a bentonite/cement mixture, or a method for routing the well in-place that ensures the complete sealing of the well. Respondents must refer to the Ohio EPA's Technical Guidance Manual for Hydrogeologic Investigations and Ground Water Monitoring Programs, June 1993, chapter 9 for further instructions/requirements on the proper abandonment of monitoring wells for the state of Ohio.

### **III. SCOPE OF REMOVAL DESIGN AND REMOVAL CLEAN-UP ACTION**

The Design/Clean-Up Action must consist of the following seven tasks. All plans are subject to U.S. EPA approval. Depending on the site-specific considerations and the level of detail provided when completing the initial tasks, one or more of the following tasks may be streamlined with the prior approval by U.S. EPA

**Task 1: Removal Design Work Plan**

**Task 2: Removal Design Phases**

1. Preliminary Design
2. Intermediate Design
3. Prefinal Design/Final Design

**Task 3: Removal Action Work Plan**

- A. Work Plan - Overall Strategy
- B. Quality Assurance Project Plan
- C. Field Sampling Plans
- D. Health and Safety Plan
- E. Construction Quality Assurance Plan

**Task 4: Prepare Work Plan Addendum**

- A. Plans and/or Maps showing extent of excavation to be conducted
- B. Health and Safety Plan for Removal Action, must include air monitoring program requirement and a contingency plan
- C. A proscribed truck route
- D. Soil excavation and handling procedures
- E. Results of all pre-removal sampling
- F. QAPP modifications as necessary to address sampling and analysis conducted during and after the removal
- G. Plan for Post-removal site control
- H. Removal Action Schedule with Major Milestones

**Task 5: Implement Clean-Up Actions/Construction**

- A. Pre-construction Meeting
- B. Pre-final Inspection
- C. Final Inspection
- D. Reports
  1. Monthly Progress Reports
  2. Completion of Removal Action Report

**Task 6: Operation and Maintenance**

**Task 7: Performance Monitoring**

**Task 1: Removal Design Work Plan**

The Respondents must submit a Work Plan which documents the overall management strategy for performing the design, construction, operation, maintenance and monitoring of Removal Actions for U.S. EPA review and approval. The plan must document the responsibility and authority of all organizations and key personnel involved with the implementation and must include a description of qualifications of

key personnel directing the Removal Design, including contractor personnel. The Work Plan must also contain a schedule of Removal Design activities. The Respondents must submit a Removal Design Work Plan in accordance with Section V, paragraph 2.1 (Work Plan and Implementation) of the AOC and Section III of this SOW.

This removal design must require pre-design studies to provide information necessary to fully implement the removal design and removal action. This Removal Design Work Plan must include, at a minimum, a pre-design QAPP, Health and Safety Plan, Field Sampling Plan, a schedule, closure of the existing ground water monitoring wells, and a survey to delineate the extent of the lead excavated area post removal associated with the eastern, western, and southern boundary of the site.

### **Task 2: Removal Design Phases**

The Respondents must prepare construction plans and specifications to implement the Removal Actions at the Site as described in the EE/CA and this SOW. The Respondents must submit plans and specifications in accordance with the schedule set forth in Section VI below. Subject to approval by U.S. EPA, Respondents may submit more than one set of design submittals reflecting different components of the Removal Action. Respondents must develop all plans and specifications in accordance with *U.S. EPA's Superfund Remedial Design and Remedial Action Guidance (OSWER Directive No. 9355.0-44)*, and must demonstrate that the Removal Action must meet all objectives of the EE/CA, the Action Memorandum, the AOC, and this SOW, including all Performance Standards. Respondents must meet regularly with U.S. EPA to discuss design issues.

#### **2.1. Preliminary Design**

Respondents must submit the Preliminary Design when the design effort is approximately 30 % complete. The Preliminary Design submittal must include or discuss, at a minimum, the following:

- 2.1.1. Preliminary plans, drawings, and sketches, including design calculations;
- 2.1.2. Results of treatability studies and additional field sampling;
- 2.1.3. Design assumptions and parameters, including design restrictions, process performance criteria, appropriate unit processes for the treatment train, and expected removal or treatment efficiencies for both the process and waste (concentration and volume);
- 2.1.4. Proposed cleanup verification methods, including compliance with Applicable or Relevant and Appropriate Requirements (ARARs);
- 2.1.5. Outline of required specifications;
- 2.1.6. Proposed siting/locations of processes/construction activity;
- 2.1.7. Expected long-term monitoring and operation requirements;
- 2.1.8. Real estate, easement, and permit requirements;
- 2.1.9. Preliminary construction schedule, including contracting strategy.

## **2.2. Intermediate Design**

Respondents must submit the Intermediate Design when the design effort is approximately 60 % complete. The Intermediate Design must fully address all comments made to the preceding design submittal. The Intermediate Design submittal must include those elements listed for the Preliminary Design, as well as the following:

- 2.2.1 Draft Performance Standard Verification Plan;
- 2.2.2. Draft Construction Quality Assurance Plan;
- 2.2.3. Draft Quality Assurance Performance Plan (QAPP);
- 2.2.4. Draft Health and Safety Plan;
- 2.2.5. Draft Field Sampling Plan (FSP);
- 2.2.6. Draft Contingency Plan

## **2.3. Pre-final and Final Designs**

Respondents must submit the Pre-final Design when the design effort is 95% complete and must submit the Final Design when the design effort is 100% complete. The Pre-final Design must fully address all comments made to the preceding design submittal. The Final Design must fully address all comments made to the Pre-final Design and must include reproducible drawings and specifications suitable for bid advertisement. The Pre-final Design will serve as the Final Design if U.S. EPA has no further comments and issues the notice to proceed. The Pre-final and Final Design submittals must include those elements listed for the Preliminary Design, as well as, the following:

- 2.3.1. Final Performance Standard Verification Plan;
- 2.3.2. Final Construction Quality Assurance Plan;
- 2.3.3. Final QAPP;
- 2.2.4. Final H & S Plan;
- 2.2.5. Final FSP;
- 2.2.6. Final Contingency Plan;
- 2.2.7. Draft Operation and Maintenance Plan;
- 2.2.8. Capital and Operation and Maintenance Cost Estimate. This cost estimate must be refined to reflect the details presented in the Final Design;
- 2.2.9. Final Project Schedule for the construction and implementation of the Removal Action which identifies timing for initiation and completion of all critical path tasks. The final

project schedule submitted as part of the Final Design must include specific dates for completion of the project and major milestones.

### **Task 3: Removal Action Work Plan**

#### **3.1. Work Plan - Overall Strategy**

The Respondents must submit a Work Plan which includes a statement of the problem(s) and potential problem(s) posed by the site and how the objectives of the completed removal action must address the problem(s) as well as a detailed description of the remediation and construction activities. The removal action work plan must include a project schedule for each major activity and submission of deliverables generated during the Removal Action. The Respondents must submit a Removal Action Work Plan in accordance with Section V paragraph 2.1 of the AOC and Section III of this SOW.

- 3.1.1 A detailed description of the design and construction activities,
- 3.1.2. A detail description of operations and maintenance;
- 3.1.3. A detail description of performance monitoring;
- 3.1.3. A description of the overall management strategy;
- 3.1.4. The work plans must describe the types of pre-removal activities to be conducted prior to solicitation of a removal subcontractor;
- 3.1.5. The work plan must document the responsibility and authority of all organizations and key personnel involved with the implementation;
- 3.1.6. The plan must include a description of qualifications of key personnel directing the Design, and the contractor personnel;
- 3.1.7. The work plans must also contain a schedule of all the above activities;
- 3.1.8. The Work Plan must include a detailed description of the technical approach for the remediation and construction activities in accordance with the final design and the EE/CA.
- 3.1.9. The work plan must specify the necessary procedures, inspections, deliverables;
- 3.1.10. A comprehensive construction management schedule for completion of each major activity and submittal must also be included.

#### **3.2. Quality Assurance Project Plan (QAPP)**

The Respondents must develop a site specific Quality Assurance Project Plan (QAPP), covering sample analysis and data handling for samples collected in all phases of the future work, based upon the AOC and guidance provided by U.S. EPA. The QAPP must be consistent with the requirements of the EPA Contract Lab Program (CLP) for laboratories proposed outside the CLP. The QAPP must at a minimum

include:

- 3.2.1. Project Description
  - 3.2.1.1 Facility Location History
  - 3.2.1.2 Past Data Collection Activity
- 3.2.2. Project Scope
- 3.2.3. Sample Network Design
- 3.2.4. Parameters to be Tested and Frequency
- 3.2.5. Project Schedule
- 3.2.5. Sampling Procedures
  - 3.2.5.1. Sample Custody
    - 3.2.5.1.1. Field Specific Custody Procedures
    - 3.2.5.1.2. Laboratory Chain of Custody Procedures
  - 3.2.5.2. Calibration Procedures and Frequency
    - 3.2.5.2.1. Field Instruments/Equipment
    - 3.2.5.2.2. Laboratory Instruments
  - 3.2.5.3. Analytical Procedures
    - 3.2.5.3.1 Non-Contract Laboratory Program
  - 3.2.5.4. Analytical Methods
    - 3.2.5.4.1. Field Screening and Analytical Protocol
    - 3.2.5.4.2. Laboratory Procedures
  - 3.2.5.5. Internal Quality Control Checks
    - 3.2.5.5.1. Field Measurements
    - 3.2.5.5.2. Laboratory Analysis
  - 3.2.5.6. Data Reduction, Validation, and Reporting
    - 3.2.5.6.1. Data Reduction
    - 3.2.5.6.2. Data Validation
    - 3.2.5.6.3. Data Reporting
  - 3.2.5.7. Performance and System Audits
    - 3.2.5.7.1. Internal Audits of Field Activity
    - 3.2.5.7.2. Internal Laboratory Audit
    - 3.2.5.7.3. External Field Audit
    - 3.2.5.7.4. External Laboratory Audit
  - 3.2.5.8. Preventive Maintenance

- 3.2.5.8.1. Routine Preventative Maintenance Procedures and Schedules
- 3.2.5.8.2. Field Instruments/Equipment
- 3.2.5.8.3. Laboratory Instruments
- 3.2.5.9. Specific Routine Procedures to Assess Data Precision, Accuracy, and Completeness
  - 3.2.5.9.1. Field Measurement Data
  - 3.2.5.9.2. Laboratory Data
- 3.2.5.10. Corrective Action
  - 3.2.5.10.1. Sample Collection/Field Measurement
  - 3.2.5.10.2. Laboratory Analysis
- 3.2.5.11. Quality Assurance Reports to Management

### 3.3. Field Sampling Plan

The Respondents must develop a field sampling plan in accordance with the **Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, October 1988.** The Field Sampling Plan should supplement the QAPP and address all sample collection activities.

### 3.4. Health and Safety Plan

The Respondents must develop a health and safety plan which is designed to protect on- site personnel and area residents from physical, chemical and all other hazards posed by this removal action. The safety plan must develop the performance levels and criteria necessary to address the following areas.

- 3.4.1. Facility Description
- 3.4.2. Personnel
- 3.4.3. Levels of protection
- 3.4.4. Safe work practices and safe guards
- 3.4.5. Medical surveillance
- 3.4.6. Personal and environmental air monitoring
- 3.4.7. Personal protective equipment
- 3.4.8. Personal hygiene
- 3.4.9. Decontamination - personal and equipment
- 3.4.10. Site work zones
- 3.4.11. Contaminant control
- 3.4.12. Contingency and emergency planning
- 3.4.13. Logs, reports and record keeping

The safety plan must follow U.S. EPA guidance and all OSHA requirements as outlined in 29 CFR 1910 and 1926.

Contingency Plan (Stand alone or in H & S)

The Respondents must submit a Contingency Plan in accordance with 40 CFR 300.150 of the National Contingency Plan describing procedures to be used in the event of an accident or emergency at the Site. The draft Contingency Plan must be submitted with the pre-final design and the draft final Contingency Plan must be submitted with the final design. The final Contingency Plan must be submitted prior to the start of construction, in accordance with the approved construction schedule. The Contingency Plan must include, at a minimum, the following:

- 3.5. Name of the person or entity responsible for responding in the event of an emergency incident.
- 3.6. Plan and date(s) for meeting(s) with the local community, including local, State and Federal agencies involved in the cleanup, as well as local emergency squads and hospitals.
- 3.7. First aid medical information.
- 3.8. Air Monitoring Plan.
- 3.9. Spill Prevention, Control, and Countermeasures (SPCC) Plan (if applicable), as specified in 40 CFR Part 109 describing measures to prevent and contingency plans for potential spills and discharges from materials handling and transportation.
- 3.10. Construction Quality Assurance Plan

Respondents must submit a Construction Quality Assurance Plan (CQAP) which describes the Site specific components of the quality assurance program which must ensure that the completed project meets or exceeds all design criteria, plans, and specifications. The draft CQAP must be submitted with the prefinal design and the "draft" final CQAP must be submitted with the final design. The Respondents must submit the final CQAP prior to the start of construction in accordance with the approved construction schedule. The CQAP must contain, at a minimum, the following elements:

- 3.10.1. Responsibilities and authorities of all organizations and key personnel involved in the design and construction of the Removal Action.
- 3.10.2. Qualifications of the Quality Assurance Official to demonstrate he possesses the training and experience necessary to fulfill his identified responsibilities.
- 3.10.3. Protocols for sampling and testing used to monitor construction.
- 3.10.4. Identification of proposed quality assurance sampling activities including the sample size, locations, frequency of testing, acceptance and rejection data sheets, problem identification and corrective measures reports, evaluation reports, acceptance reports, and final documentation. A description of the provisions for final storage of all records consistent with the requirements of the Consent Decree must be included.
- 3.10.5. Reporting requirements for CQA activities must be described in detail in the CQA plan. This must include such items as daily summary reports, inspection data sheets, problem



identification and corrective measures reports, design acceptance reports, and final documentation. Provisions for the final storage of all records must be presented in the CQA plan.

#### **Task 4: Prepare Work plan Addendum**

Respondents must prepare a Removal Design/Removal Action Work plan Addendum which must consist of:

- 4.1. Construction plans and specifications to implement the Clean-Up Actions at the Site as described in the Action Memo and this SOW such as plans and/or maps showing the extent of excavation to be conducted and the proposed locations of construction activity.
- 4.2. Health and Safety Plan to be utilized during the removal action including provisions for air monitoring, contingency planning, decontamination pad construction, maintenance, and procedures for trucks leaving the site.
- 4.3. An approved truck route.
- 4.4. Soil excavation and handling procedures.
- 4.5. Removal action schedule with major milestones identified.
- 4.6. The results of all conducted pre-removal sampling and analysis.
- 4.7. Any other submittals from the original work plan which require modification such as the QAPP must now describe sampling to be conducted during and after the removal action.

#### **Task 5: Implement Removal Actions/Construction**

Plans and specifications must be submitted in accordance with the schedule set forth below in Section IV of this SOW. Subject to approval by U.S. EPA, Respondents may submit more than one set of submittals reflecting different components of the Removal Action. All plans and specifications must be developed in accordance with professional engineering practices and must demonstrate that the removal action must meet all objectives of the EE/CA, Action Memo, the AOC and this SOW, including all Performance Standards. Respondents must meet regularly with U.S. EPA as necessary to resolve any design issues. The Respondents must implement the Clean-Up Action(s) as detailed in the approved Final Removal Design. Respondents must complete the following activities in constructing the Removal Action.

- 5.1. Preconstruction inspection(s) and meeting(s).

The Respondents must participate with the U.S. EPA and Ohio EPA in a pre-construction inspection meeting to:

- 5.1.1 Review methods for documenting and reporting inspection data;
- 5.1.2. Review methods for distributing and storing documents and reports;
- 5.1.3. Review work area security and safety protocol;

- 5.1.3. Discuss any appropriate modifications of the construction quality assurance plan to ensure that site-specific considerations are addressed;
- 5.1.4. Conduct a Site walk-around to verify that the design criteria, plans, and specifications are understood and to review material and equipment storage locations.
- 5.1.5 The preconstruction inspection and meeting must be documented by a designated person and minutes must be transmitted to all parties.

#### 5.2. Pre-final inspection:

The Respondents must notify the U.S. EPA for the purposes of conducting a pre-final inspection within 30 days after Respondents makes a preliminary determination that construction is complete. The inspection is to determine whether the project is complete and consistent with the contract documents and the Removal/Clean-Up Action. The pre-final inspection must consist of:

- 5.2.1. A walk-through inspection of the entire Facility affected by the clean-up with U.S. EPA and Ohio EPA.
- 5.2.2. Identify and note any outstanding construction items discovered during the inspection.

#### 5.3. The pre-final inspection report must:

- 5.3.1. Outline the outstanding construction items and document corrective actions required to resolve the items
- 5.3.2. Completion date for the documented corrective actions
- 5.3.3. Provide a proposed date for the final inspection

#### 5.4. Final inspection

Within 30 days after completion of any work identified in the pre-final inspection report, the Respondents must notify the U.S. EPA and Ohio EPA for the purposes of conducting a final inspection.

The final inspection must consist of a walk-through inspection of the Facility affected by the clean-up by U.S. EPA, Ohio EPA, and the Respondents.

- 5.4.1. Utilize the pre-final inspection report must be used as a checklist with the final inspection focusing on the outstanding construction items identified in the pre-final inspection.
- 5.4.2. Confirmation must be made that outstanding items have been resolved.
- 5.4.3. Reports

These reports must document all significant developments during the preceding period, to include:

- 5.4.3.1. Monthly Progress Reports.
- 5.4.3.2. The work performed and any problems encountered;
- 5.4.3.3. Waste volumes transported off-site broken down into the following categories:  
RCRA and solid waste;
- 5.4.3.4. Analytical data received during the reporting period;
- 5.4.3.5. Developments anticipated during the next reporting period including a schedule of work to be performed;
- 5.4.3.6. Anticipated problems, planned resolutions of past or anticipated problems;
- 5.4.3.7. Identify any changes in key personnel.
- 5.4.3.8. Projected work for the next reporting period;
- 5.4.3.9. Copies of reports, including but not limited to daily reports, field logs, inspection reports, and laboratory/monitoring data.

#### 5.5. Completion of Removal Action Report

Within 30 days of a successful final inspection, Respondents must submit a Completion of Removal Action Report. In the report, a registered professional engineer and the Settling Defendants' Project Coordinator must state the Removal Action has been completed in full satisfaction of the requirements of this SOW. The written report must include as-built drawings signed and stamped by a professional engineer. The report must contain the following statement, signed by a responsible corporate official of the Respondents or the Respondents' Project Coordinator:

*"To the best of my knowledge, after thorough investigation, I certify that the information contained in or accompanying this submission is true, accurate and complete. I am aware there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."*

#### **Task 6: Operation and Maintenance**

The Respondents must prepare an Operation and Maintenance (O&M) Plan to cover both implementation and long term maintenance of the Removal Actions. An initial Draft O&M Plan must be submitted as a final Design Document submission. The final O&M Plan must be submitted to U.S. EPA prior to the pre-final construction inspection, in accordance with the approved construction schedule. The plan must be composed of the following elements:

- 6.1. Description of normal operation and maintenance ;
  - 6.1.1. Description of tasks for operation;
  - 6.1.2. Description of tasks for maintenance;
  - 6.1.3. Description of prescribed treatment or operation conditions;
  - 6.1.4. Schedule showing frequency of each O&M task.

- 6.2. Description of potential operating problems;
  - 6.2.1. Description and analysis of potential operation problems;
  - 6.2.2. Sources of information regarding problems;
  - 6.2.3. Common and/or anticipated remedies.
- 6.3. Description of routine monitoring and laboratory testing;
  - 6.3.1. Description of monitoring tasks;
  - 6.3.2. Description of required data collection, laboratory tests and their interpretation;
  - 6.3.3. Required quality assurance, and quality control ;
  - 6.3.4. Schedule of monitoring frequency and procedures for a petition to U.S. EPA to reduce the frequency of or discontinue monitoring;
  - 6.3.5. Description of verification sampling procedures if Cleanup or Performance Standards are exceeded in routine monitoring.
- 6.4. Description of alternate O&M;
  - 6.4.1. Should systems fail, alternate procedures to prevent release or threatened releases of hazardous substances; pollutants or contaminants which may endanger public health and the environment or exceed performance standards;
  - 6.4.2.. Analysis of vulnerability and additional resource requirement should a failure occur.
- 6.5. Corrective Action;
  - 6.5.1. Description of corrective action to be implemented in the event that cleanup or performance standards are exceeded;
  - 6.5.2. Schedule for implementing these corrective actions.
- 6.6. Safety plan;
  - 6.6.1. Description of precautions, of necessary equipment, etc., for Site personnel;
  - 6.6.2. Safety tasks required in event of systems failure.
- 6.7. Description of equipment; and
  - 6.7.1. Equipment identification;
  - 6.7.2. Installation of monitoring components;
  - 6.7.3. Maintenance of Site equipment;
  - 6.7.4. Replacement schedule for equipment and installed components.
- 6.8. Records and reporting mechanisms required.
  - 6.8.1. Daily operating logs;
  - 6.8.2. Laboratory records;
  - 6.8.3. Records for operating costs;
  - 6.8.4. Mechanism for reporting emergencies;
  - 6.8.5. Personnel and maintenance records;

6.8.6. Monthly/annual reports to US EPA and Ohio EPA.

**Task 7: Performance Monitoring**

Performance monitoring must be conducted to ensure that all Performance Standards are met.

7.1. Performance Standard Verification Plan

The purpose of the Performance Standard Verification Plan is to provide a mechanism to ensure that both short-term and long-term Performance Standards for the Removal Action are met. The Draft Performance Standards Verification Plan must be submitted with the Intermediate Design. Once approved, the Performance Standards Verification Plan must be implemented on the approved schedule. The Performance Standards Verification Plan must include:

7.2. Quality Assurance Project Plan

7.3. Health and Safety Plan

7.4. Field Sampling Plan

#### **IV. SUMMARY OF MAJOR DELIVERABLES/SCHEDULES**

A summary of the project schedule and reporting requirements contained in this SOW is presented below:

<b>Submission</b>	<b>Due Date</b>
1. Removal Design/Removal Action Work Plan	60 days after effective date of order
2. Removal Design/Removal Action Work Plan Addendum	45 days after completion of pre-removal field sampling
3. Award Clean-up Actions Contract(s)	Thirty (30) days after receipt of USEPA's approval of Work Plan Addendum
4. Pre-Construction Inspection and Meeting	(15) days after Award of RA Contract(s)
5. Initiate Construction of RA	15 days after Pre-Construction Inspection and meeting
6. Pre-final Inspection	No later than 15 days after completion of construction
7. Pre-final Inspection Report	15 days after completion of prefinal inspection
8. Final Inspection	15 days after completion of work identified in prefinal inspection report
9. Final O&M Plan	No later than Prefinal Inspection
10. Construction Completion Report	30 days after final inspection
11. Completion of Clean-up Action Report	30 days after final inspection
12. Completion of Work Report	See Section XVII in the AOC and Task 5.5 of this SOW

**Attachment 1**  
**Regulations and Guidance Documents**

The following list, although not comprehensive, comprises many of the regulations and guidance documents that apply to the NTCRA process:

1. American National Standards Practices for Respiratory Protection. American National Standards Institute Z88.2-1980, March 11, 1981.
2. ARCS Construction Contract Modification Procedures September 89, OERR Directive 9355.5-01/FS.
3. CERCLA Compliance with Other Laws Manual, Two Volumes, U.S. EPA, Office of Emergency and Remedial Response, August 1988 (DRAFT), OSWER Directive No. 9234.1-01 and -02.
4. Community Relations in Superfund — A Handbook, U.S. EPA, Office of Emergency and Remedial Response, June 1988, OSWER Directive No. 9230.0-3B.
5. A Compendium of Superfund Field Operations Methods, Two Volumes, U.S. EPA, Office of Emergency and Remedial Response, EPA/540/P-87/001a, August 1987, OSWER Directive No. 9355.0-14.
6. Construction Quality Assurance for Hazardous Waste Land Disposal Facilities, U.S. EPA, Office of Solid Waste and Emergency Response, October 1986, OSWER Directive No. 9472.003.
7. Contractor Requirements for the Control and Security of RCRA Confidential Business Information, March 1984.
8. Data Quality Objectives for Remedial Response Activities, U.S. EPA, Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, EPA/540/G-87/003, March 1987, OSWER Directive No. 9335.0-7B.
9. Engineering Support Branch Standard Operating Procedures and Quality Assurance Manual, U.S. EPA Region IV, Environmental Services Division, April 1, 1986 (revised periodically).
10. EPA NEIC Policies and Procedures Manual, EPA-330/9-78-001-R, May 1978, revised November 1984.
11. Federal Acquisition Regulation, Washington, DC: U.S. Government Printing Office (revised periodically).
12. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, U.S. EPA, Office of Emergency and Remedial Response, October 1988, OSWER Directive NO. 9355.3-01.
13. Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potential Responsible Parties, U.S. EPA Office of Emergency and Remedial Response, EPA/540/G-90/001, April 1990.
14. Guidance on Expediting Remedial Design and Remedial Actions, EPA/540/G-90/006, August 1990.
15. Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites, U.S. EPA Office of Emergency and Remedial Response (DRAFT), OSWER Directive No. 9283.1-2.
16. Guide for Conducting Treatability Studies Under CERCLA, U.S. EPA, Office of Emergency and Remedial Response, Prepublication version.
17. Guide to Management of Investigation-Derived Wastes, U.S. EPA, Office of Solid Waste and Emergency Response, Publication 9345.3-03FS, January 1992.
18. Guidelines and Specifications for Preparing Quality Assurance Project Plans, U.S. EPA, Office of Research and Development, Cincinnati, OH, QAMS-004/80, December 29, 1980.
19. Health and Safety Requirements of Employees Employed in Field Activities, U.S. EPA, Office of Emergency and Remedial Response, July 12, 1982, EPA Order No. 1440.2.
20. Interim Guidance on Compliance with Applicable of Relevant and Appropriate Requirements, U.S. EPA, Office of Emergency and Remedial Response, July 9, 1987, OSWER Directive No. 9234.0-05.
21. Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, U.S. EPA, Office of Emergency and Remedial Response, QAMS-005/80, December 1980.
22. Methods for Evaluating the Attainment of Cleanup Standards: Vol. 1, Soils and Solid Media, February 1989,

- EPA 23/02-89-042; vol. 2, Ground water (Jul 1992).
23. National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule, Federal Register 40 CFR Part 300, March 8, 1990.
  24. NIOSH Manual of Analytical Methods, 2nd edition. Volumes I-VII for the 3rd edition, Volumes I and II, National Institute of Occupational Safety and Health.
  25. Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, National Institute of Occupational Safety and Health/Occupational Health and Safety Administration/United States Coast Guard/Environmental Protection Agency, October 1985.
  26. Permits and Permit Equivalency Processes for CERCLA On-Site Response Actions, February 19, 1992, OSWER Directive 9355.7-03.
  27. Procedure for Planning and Implementing Off-Site Response Actions, Federal Register, Volume 50, Number 214, November 1985, pages 45933-45937.
  28. Procedures for Completion and Deletion of NPL Sites, U.S. EPA, Office of Emergency and Remedial Response, April 1989, OSWER Directive No. 9320.2-3A.
  29. Quality in the Constructed Project: A Guideline for Owners, Designers and Constructors, Volume 1, Preliminary Edition for Trial Use and Comment, American Society of Civil Engineers, May 1988.
  30. *Remedial Design/Remedial Action (RD/RA) Handbook*, U.S. EPA, Office of Solid Waste and Emergency Response (OSWER) 9355.0-04B, EPA 540/R-95/059, June 1995.
  31. Revision of Policy Regarding Superfund Project Assignments, OSWER Directive No. 9242.3-08, December 10, 1991. [Guidance, p. 2-2]
  32. Scoping the Remedial Design (Fact Sheet), February 1995, OSWER Publ. 9355-5-21 FS.
  33. Standard Operating Safety Guides, U.S. EPA, Office of Emergency and Remedial Response, November 1984.
  34. Standards for the Construction Industry, Code of Federal Regulations, Title 29, Part 1926, Occupational Health and Safety Administration.
  35. Standards for General Industry, Code of Federal Regulations, Title 29, Part 1910, Occupational Health and Safety Administration.
  36. Structure and Components of 5-Year Reviews, OSWER Directive No. 9355.7-02, May 23, 1991. [Guidance, p. 3-5]
  37. Superfund Guidance on EPA Oversight of Remedial Designs and Remedial Actions Performed by Potentially Responsible Parties, April 1990, EPA/540/G-90/001.
  38. Superfund Remedial Design and Remedial Action Guidance, U.S. EPA, Office of Emergency and Remedial Response, June 1986, OSWER Directive No. 9355.0-4A.
  39. Superfund Response Action Contracts (Fact Sheet), May 1993, OSWER Publ. 9242.2-08FS.
  40. TLVs-Threshold Limit Values and Biological Exposure Indices for 1987-88, American Conference of Governmental Industrial Hygienists.
  41. Treatability Studies Under CERCLA, Final. U.S. EPA, Office of Solid Waste and Emergency Response, EPA/540/R-92/071a, October 1992.
  42. USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis, U.S. EPA, Office of Emergency and Remedial Response, July 1988.
  43. USEPA Contract Laboratory Program Statement of Work for Organic Analysis, U.S. EPA, Office of Emergency and Remedial Response, February 1988.
  44. User's Guide to the EPA Contract Laboratory Program, U.S. EPA, Sample Management Office, August 1982.
  45. Value Engineering (Fact Sheet), U.S. EPA, Office of Solid Waste and Emergency Response, Publication 9355.5-03FS, May 1990.
  46. Guide to Documenting Cost and Performance for Remediation Projects, Publication EPA-542-B-95-002, March 1995.
  47. Presumptive Remedies: Policy and Procedures, U.S. EPA, Office of Solid Waste and Emergency Response, Directive 9355.0-47FS, EPA 540-F-93-047, PB 93-963345, September, 1993.



48. Presumptive Remedies for Soils, Sediments, and Sludges at Wood Treater Sites, U.S. EPA, Office of Solid Waste and Emergency Response, Directive 9200.5-162, EPA/540/R-95/128, PB 95-963410, November, 1995.
49. Presumptive Response Strategy and Ex-Situ Treatment Technologies for Contaminated Groundwater at CERCLA Sites, U.S. EPA, Office of Solid Waste and Emergency Response, Directive 9283.1-12, EPA 5401R/023, June, 1996.
50. "Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA, USEPA, Office of Emergency and Remedial Response 1993, EPA/540-R-93-057"

## **Attachment A - Respondents**

NL Industries, Inc.  
Alcolac, Inc.  
Alpha Metals, Inc.  
American National Can Company (n/k/a Rexam Beverage Can Company)  
American Spring Wire Corp.  
Anchor Swan, Inc. (by Dayco Products, LLC, successor-in-interest)  
Anzon, Inc. (n/k/a AI Divestitures, Inc.)  
Arcon Equipment Inc.  
Atlantic Battery Corp./Power Battery Co., Inc.  
ATR Wire & Cable Co. Inc.  
Central Can Company  
Crown Cork & Seal Company, Inc. (on its own behalf and on behalf of Dames Can Company)  
E.I. du Pont de Nemours and Company (Remington Arms Company, DuPont Company Subsidiaries)  
Estwing Manufacturing Company  
Federated-Fry Metals, Inc.  
Fusion Incorporated  
General Dynamics/Electric Boat Corporation  
GHR Recycling Inc.  
The Goodyear Tire & Rubber Company  
Gould Electronics Inc.  
Heekin Can, Inc. (n/k/a Ball Metal Food Container Corp.)  
Johnson Controls Battery Group, Inc., on behalf of itself and Johnson Controls, Inc.  
Lenox, Incorporated  
Mark C. Pope Associates, Inc.  
Matsushita Display Devices Company of America  
Miami Industrial Trucks, Inc.  
Morgan Advanced Ceramics, Inc.  
New York State Thruway Authority  
OHM Resource Recovery Corp. (by Advanced Environmental Tech Services, LLC  
Owens-Illinois, Inc. (predecessor-in-interest to OI-NEG TV Products, Inc. and Techneglas, Inc., successor-in-interest to OI-NEG TV Products, Inc.)  
Philips Electronics North America Corporation on behalf of Philips Display Components Company  
Piezo Kinetics, Inc.  
REL TEC Communications, Inc. (n/k/a Marconi Communications, Inc.)  
Sam Allen & Son, Inc. (n/k/a Newman/Allen Enterprises, Inc.)  
Seneca Wire & Manufacturing Company  
Sony Electronics Inc.  
St. George Crystal, Ltd.  
Teknor Apex Company

Thomson Multimedia Inc.  
Toshiba Display Devices, Inc.  
Unisys Corporation (successor to Sperry Corporation)  
United States Can Company  
United States Steel Corporation  
Vernitron Corp. (n/k/a Axsys Technologies, Inc.)  
Victory White Metal  
Zenith Electronics Corporation (Rauland Division)

**Attachment B - Limited Respondents for Operation and Maintenance Only**

Northern Ohio Lumber & Timber Co.  
Bredt-Zanick LLC

## **APPENDIX B**

### **FINAL PERFORMANCE STANDARD VERIFICATION PLAN**

**Final RD/RA Workplan  
Appendix B – Performance Standards Verification Plan  
Master Metals Site  
Cleveland, Ohio**

**TABLE OF CONTENTS**

<b><u>Section</u></b>	<b><u>Page</u></b>
<b>1.0 INTRODUCTION.....</b>	<b>1</b>
1.1 COORDINATING DOCUMENTS .....	1
1.2 PROJECT SCOPE OF WORK.....	1
1.3 SUMARY OF PERFORMANCE STANDARDS.....	3
<b>2.0 EXCVATION ACTIVITIES .....</b>	<b>3</b>
<b>3.0 XRF FIELD SCREENING .....</b>	<b>4</b>
<b>4.0 POST EXCAVATION SAMPLING .....</b>	<b>4</b>
<b>5.0 TREATMENT OF SOIL.....</b>	<b>4</b>
<b>6.0 TREATMENT VERIFICATION SAMPLING .....</b>	<b>5</b>
<b>7.0 TRANSPORTATION AND OFF-SITE DISPOSAL.....</b>	<b>5</b>
<b>8.0 BACKFILL ACITIVITIES .....</b>	<b>5</b>
<b>9.0 AIR MONITORING.....</b>	<b>6</b>
<b>10.0 LONG-TERM MAINTENANCE .....</b>	<b>6</b>

**List of Tables**

Table PSVP-I	Performance Standards
Table PSVP-II	Target Compound List Parameters
Table PSVP-III	8 RCRA Metals List

## **1.0 INTRODUCTION**

The Performance Standard Verification Plan (PSVP) is designed to ensure that both short-term and long-term performance standards are met for the removal design and removal action (RD/RA) at the Master Metals Superfund Site (MMI) site in Cleveland, Ohio. This PSVP, a part of the RD/RA Work Plan, references the Contingency Plan, the Field Sampling Plan, the Health and Safety Plan and the Quality Assurance Project Plan. The PSVP describes the methods that will be used to sample and analyze in-place soils, treated soils, air, and backfill.

### **1.1 Coordinating Documents**

The plans that will be prepared and submitted during the course of this project include the following:

- RD/RA Work Plan
- Contingency Plan
- Field Sampling and Analysis Plan
- Health and Safety Plan
- Performance Standard Verification Plan
- Quality Assurance Project Plan
- Design and Construction Quality Assurance Project Plan
- Stormwater Runoff Prevention Plan
- Operation and Maintenance Plan

The reports that will be prepared and submitted during the course of this project include the following:

- Pre-Final Inspection Report
- Construction Completion Report
- Completion of Work Report

### **1.2 Project Scope of Work**

The scope of work for the removal action includes the following activities:

- Clear and grub areas requiring excavation of all trees and brush for disposal off-site.
- Demolish above-grade concrete and metal structures remaining on-site after the Phase I TCR demolition activities in accordance to the design specifications. Sized concrete construction debris will either be used as a sub-base material in areas to be covered with the asphalt cover or will be transported off-site disposal as construction debris. All wood, bricks or metal debris that are removed will be disposed of off-site as construction debris.
- Establish a coordinate grid system along the perimeter of the property outside the fence line and in on-property areas where excavation is required.

- Excavate off-property soils along the western, eastern and southern perimeter of the MMI facility, that exceed the RBRG of 1,000 mg/Kg or until historic slag fill material is encountered, whichever comes first. XRF screening technology will be used to guide the depth of the excavations during removal.
- Excavate designated on-property soils that are not under concrete or the proposed asphalt cover (including grids I1, J1 and K1 excavated during the Phase I TCR) that exceed the RBRG of 1,000 mg/Kg or until historic slag fill material is encountered, whichever comes first.
- Conduct confirmatory soil sampling from the excavation floor in grids where the excavation was terminated prior to reaching the historic slag fill material to confirm that all soils that are above the cleanup level have been excavated and removed.
- Backfill all excavated areas once verified to have met the RBRG or have reached historic slag fill, and grading to promote positive drainage in accordance with the design documents. Backfill for areas not covered by asphalt or concrete will be filled with clean imported fill material that has been approved for use based on analytical results and is suitable to maintain vegetative growth.
- Stabilize excavated soils to meet the applicable LDRs for contaminated soils for lead, and any underlying hazardous constituent (UHC) during waste profiling, to render the material nonhazardous for either use as fill in low areas beneath the proposed asphalt cover or for off-site disposal at an approved Subtitle D facility.
- Conduct verification sampling of treated soils using TCLP lead analysis to verify the material has been rendered non-hazardous for lead prior to either placement in low areas beneath the proposed asphalt cover or for off-site disposal as nonhazardous waste.
- Off-site disposal of all treated soils not used to fill low areas beneath the proposed asphalt cover, including stockpiled soils from the Holmden Properties Removal Action, in accordance with the SOW and the approved design plan.
- Place an asphalt cover over the deteriorated area of the concrete located in southern portion of the site in accordance with the design documents.
- Recondition existing concrete surfaces not under the asphalt cover by sealing any significant cracks and breaks that extend through the concrete surface, followed by encapsulation of the concrete surface, in accordance with the approved design plan.
- Abandon of all existing monitoring wells on site in accordance to applicable State of Ohio regulations (OAC-3745-9-10).
- Remove any existing solid waste including Investigative Derived Waste (IDW) from previous or current removal actions.
- Install a perimeter chain-link fence and three double-swing gates at the completion of the RA



to control site access at the site in accordance with the design documents.

- Development of an Operation and Maintenance (O&M) Plan to ensure the integrity of the remedy by maintaining and repairing the concrete and asphalt cover, and the perimeter fencing for a period of thirty (30) years, and as specified in the AOC.

### **1.3 Summary of Performance Standards (See Table PSVP-I)**

The performance standards for the removal action are:

- Lead RBRG for soils: 1,000 mg/Kg total lead on-site and off-property perimeter soils;
- Excavation depth: until either the RBRG of 1,000 mg/Kg total lead is met, or until historic slag fill is encountered, whichever comes first;
- In accordance to the SOW, the more restrictive value of contaminated soil LDR requirements (10 times the Universal Treatment Standard (UTS) or 7.5 mg/L lead) and the nonhazardous characteristic criteria (<5 mg/L TCLP lead) prior to off-site disposal at a permitted Subtitle D landfill;
- Imported Backfill Criteria: TCL/TAL analyses at or below background concentrations, in accordance to the OEPA requirements (refer to Table II, III for complete listing);
- Backfill Procedures: runoff shall be directed to existing catch basins in accordance with the design documents; no erosion of final grade, no ponding;
- XRF calibration for field screening;
- Verification of horizontal and vertical extents of contamination with off-site laboratory confirmatory analyses in grids where excavation was terminated prior to encountering historic slag fill; Air monitoring to ensure fugitive dust emissions do not exceed the action levels as specified in the SOW (187.5 µg/m<sup>3</sup> for particulate matter);
- O&M Program for a maximum of 30 years, annual inspections and repairs within 30 days; and,
- Site security during the RA, prevent access to the MMI Site and after the RA control access to MMI site.

## **2.0 EXCAVATION ACTIVITIES**

On-property soils identified in the SOW that will not be covered with concrete or the asphalt, and off-site perimeter soils delineated during the Phase II EE/CA, with total lead concentrations greater than the excavation standard of 1,000 mg/Kg will be excavated and staged for treatment. All excavated soils will be treated to meet the more restrictive of the applicable land disposal restriction (<7.5 mg/L) and nonhazardous characteristic criteria (<5.0 mg/L), and off-site disposal

at an approved Subtitle D landfill. Some treated material may be used to fill depressions to grade in areas that will be covered with asphalt.

### **3.0 XRF FIELD SCREENING**

An XRF analyzer will be used as a field-screening device to guide the extent and depth of the excavation and assist in determining if the RBRG of 1,000 mg/Kg has been reached prior to encountering the historic slag fill. The XRF instrument will not be used to verify or evaluate the achievement of any performance standard or criteria at the site. XRF screening is discussed in Section 3.0 of the FSAP (Appendix C of the RD/RA Workplan).

Each XRF screening location will be numbered for incorporation into the XRF log-in database as stated in the Field Sampling Plan. The XRF analyzer will be calibrated according to the procedures described in the XRF Standard Operating Procedures presented in Attachment FSAP-1 of the FSAP.

### **4.0 POST-EXCAVATION SAMPLING**

In the event that the results of XRF screening indicate that the in-place soils are below the RBRG prior to reaching the historic slag fill, post-excavation confirmatory samples will be collected. Each confirmatory sample will be collected as a single grab sample from upper 0 to 3 inches of the floor of the sample grid, and thoroughly mixed to achieve a homogenous blend. If the maximum limit of excavation is reached, encountering the historic slag fill material, then confirmatory samples will not be collected. All samples will be submitted to the approved laboratory and analyzed for total lead to confirm that the performance standards have been met and lead-impacted materials have been removed. If the results of confirmation sampling and analysis indicate that the in-place soils did not achieve the excavation performance standard, additional material will be excavated and the process will be repeated until the specified standards are achieved. The extent of additional soil removal will either be based on the results of XRF screening, visual determination, or laboratory analysis throughout the excavation process.

Sampling activities will follow the procedures outlined in the QAPP and the FSAP. All samples will be properly documented and submitted to the off-site laboratory for total lead analysis. Global positioning software will be used to delineate the various areas and reproduce the grids of sample collection and where confirmatory sampling samples were collected.

### **5.0 TREATMENT OF SOIL**

Excavated soils will be treated in the treatment containment area. In accordance with Section 4.2.2 of the approved Work Plan, the staging/treatment containment area will be constructed to be a secondary containment unit for the stabilization process. The stabilization process for the lead-impacted soils, sometimes referred to as immobilization or fixation, uses additives to chemically immobilize the hazardous constituents of a contaminated soil by combining the additives and lead-bearing soil within a mixing device. ENTACT has developed a proprietary list of additives for stabilizing heavy metal waste including phosphoric

acid, monocalcium phosphate (TSP), monoammonium phosphate, and diammonium phosphate either alone or in combination with Portland Cement.

When applied to lead-impacted soils, the additive/additive blends permit the rapid reaction of free lead with anionic compounds. The first component is a phosphate ion that reacts with metals such as lead to form a salt that is insoluble under normal environmental conditions. The second component is the phosphoric acid buffer system that provides stability to the treated waste mixture under minor environmental changes. The stabilization process and ENTACT patent-pending additives provide the necessary components for successful stabilization of lead contaminated soil with thorough mixing.

A treatability study was completed for the lead-contaminated soils at the MMI site as part of the Phase I TCR action and is included in Appendix E of the RD/RA Workplan.

## **6.0 TREATMENT VERIFICATION SAMPLING**

Verification sampling for the treated soils will follow the sampling protocol outlined in the QAPP and FSAP. The frequency of treatment verification sampling will be one composite sample consisting of seven (7) aliquots from every 250 cubic yards of treated material for the first 1,000 cubic yards of material treated, and at increments of 500 cubic yards thereafter.

Verification samples will be submitted to the QAPP-approved laboratory and analyzed for TCLP lead and any underlying hazardous constituent (UHC) identified during the waste profiling, to ensure that the treatment was successful in rendering the material nonhazardous. If the stabilized soils are to be placed on-site, total lead levels shall also be analyzed. If the verification sample indicates that treatment has failed to achieve cleanup standards of less than 5.0 mg/L TCLP lead, or the applicable UHC criterion, the entire batch will be retreated and re-sampled.

## **7.0 TRANSPORTATION AND OFF-SITE DISPOSAL**

An estimated 1,800 cubic yards of soils will be excavated and treated as part of the removal action at the MMI site to meet RCRA land disposal restrictions and render the material nonhazardous. The treated material and the stockpiled treated soils from the Holmden Properties RA, not used to fill depressions beneath the asphalt cover system, will be transported off-site to an approved Subtitle D landfill. Each load of treated material/soil that is shipped off-site will be properly tarped and documented by means of the bills of lading completed with each hauling truck leaving the site. These documents will be collected and included in the final report.

## **8.0 BACKFILL ACTIVITIES**

Prior to any excavating or grading activities, ENTACT will install appropriate silt fencing to prevent any erosion and surface runoff as discussed in the Erosion Control Plan (Appendix F of the RD/RA Workplan). After excavation activities have been completed to achieve the performance standards, ENTACT will begin backfilling the RA excavations with clean imported fill suitable for the intended land reuse. ENTACT will grade the excavated areas to ensure proper

drainage and to control any additional ponding of water that may occur during implementation of the remedy. Perimeter excavation areas will be planted with new vegetation. Property fencing that is removed to facilitate excavation will also be replaced.

Prior to the backfilling activities, any imported fill material and topsoil will be sampled and analyzed for the eight (8) RCRA metals, volatile organic compounds (VOCs), pesticides and polychlorinated biphenyls (PCBs), total petroleum hydrocarbons (TPH) in accordance with the workplan and field sampling plan. In addition, the stockpiled sand fill from on-property areas requiring re-excavation will also be analyzed for the same parameters to ensure the material is suitable for reuse. If TPH levels exceed the OEPA petroleum fraction residual saturation concentrations listed in Table I under Ohio Rule 3745-300-8 [8 to 40 mg/Kg for glacial till or silty clay soils] then the backfill shall also be analyzed for the specific semi-volatile organic compounds (SVOCs) required under that rule. Refer to Table II and Table III of the Performance Standard Verification Plan for details on the analytes and compounds to be tested and the associated laboratory method.

One grab sample will be collected for every 10,000 cubic yards of imported fill. One 7-part composite sample will be collected for every 10,000 cubic yards of imported fill from a single source area. For VOC analysis, 4 separate samples will be collected. ENTACT will present the necessary documentation that the required testing has been completed and meets the Agencies criteria prior to using the backfilled materials. All sampling procedures performed by ENTACT will follow protocols outlined in the FSAP and QAPP.

## **9.0 AIR MONITORING**

Throughout the removal action, ENTACT will monitor for fugitive dust emissions from soil excavation, handling and backfilling operations, in accordance with the AOC and SOW. Fugitive particulates at the Property boundary will be monitored in accordance with the FSAP (Appendix C of the RD/RA Workplan).

Particulate concentrations at the property boundary will not exceed the action levels specified in the SOW: 187.5 µg/m<sup>3</sup>, which is one half of the 24 hour National Air Quality Standard (NAAQ) for particulate exposure, converted to a one-hour averaging period. A minimum of three air monitoring stations will be set up to include, at a minimum, one upwind location and two downwind locations. Air monitoring procedures will follow the methodology specified in the FSAP and QAPP.

## **10.0 LONG-TERM MAINTENANCE**

ENTACT will maintain and replace the existing fence at the MMI Site throughout the RD/RA phases, and prevent access and vandalism to the MMI Site. Once the RA has been completed, the perimeter fence will be repaired or replaced as needed as part of the operation and maintenance procedures to ensure that access to the site is controlled and consistent with future land use at the MMI Site.

Long-term maintenance will be conducted in accordance to the O&M Plan that will provide for long-term integrity of the concrete and asphalt barriers, and the perimeter fence to ensure the integrity of the remedy for a period of 30 years. A Health and Safety Plan will be provided in the O&M for any intrusive construction work that may need to be conducted through the concrete or asphalt covers.

Performance Standard Verification Plan Table PSVP-I Performance Standards	
<b>Excavation Activities</b>	Excavation of on-property soils in areas not covered by concrete or the asphalt cover or addressed during the Phase I TCR action, and off-site soils delineated in the Phase II EE/CA to either the RBRG of 1,000 mg/Kg total lead is achieved or the historic slag fill is encountered, whichever comes first. Excavated soils will be staged for treatment in the pre-treatment staging area.
<b>XRF Field Screening</b>	The XRF instrument will be used only as a field-screening tool to assist in determining if the performance standard of 1,000 mg/Kg has been achieved prior to reaching the historic slag fill. The XRF instrument is used only to guide the extents of excavation and not to verify or evaluate the achievement of any performance standard or criteria at the site. Calibration will be in accordance to the Field Sampling Plan. XRF will screen each excavated grid square in four locations. If XRF screening indicates that the criteria has been met before the historic slag is encountered, then a confirmatory sample will be collected for fixed laboratory analysis to verify that the performance standard has been met as described below.
<b>Post-Excavation Sampling</b>	For grids where excavation is terminated before the historic slag is encountered, a grab sample will be collected from the upper 0 to 3 inches in the center of each grid, and submitted to the approved laboratory for analysis of total lead. The sampling procedures will follow the approved QAPP and Field Sampling Plan
<b>Treatment</b>	Soils will be treated in batches within the constructed treatment containment area using a pre-determined ratio of additive blend to impacted soils to effectively render the soils nonhazardous (< 5.0 mg/L lead). Treatment to the 5.0 mg/L lead criteria is below the RCRA LDR for lead in contaminated soils of 7.5 mg/L (10 times the UTS of 0.75 mg/L). Treated soils will be disposed off-site at an approved Subtitle D landfill..
<b>Verification Sampling</b>	Verification sampling for the treated soils will be conducted prior to placement and consolidation in order to verify that the treatment standard of 5.0 mg/L lead has been met. The samples will consist of one grab sample for every 250 cubic yards for the first 1,000 cubic yards treated, and at increments of one sample for every 500 cubic yards thereafter in accordance to the approved QAPP and FSAP.
<b>Asphalt Cover</b>	A minimum 4-inch asphalt cover will be placed over the southern portion of the site where the concrete has deteriorated. The asphalt cover will be placed in accordance with the approved design specifications.

<b>Long-Term Maintenance</b>	Annual inspections to ensure access to site is controlled and consistent with future land use at the MMI site. Implementation of operation and maintenance plan to maintain the concrete and asphalt cover for a period of 30 years.
------------------------------	--

Performance Standard Verification Plan  
Table PSVP-II  
Target Compound List (TCL)

VOLATILES	METHOD REPORTING LIMITS		
	Water µg/L	Low Soil µg/Kg	Med. Soil µg/Kg
Chloromethane	5	5	1200
Bromomethane	5	5	1200
Trichlorofluoromethane	5	5	1200
Dichlorodifluoromethane	5	5	1200
Vinyl chloride	5	5	1200
Chloroethane	5	5	1200
Acetone	25	25	1200
Carbon disulfide	5	5	1200
1,1-Dichloroethene	5	5	1200
1,1-Dichloroethane	5	5	1200
1,2-Dichloroethene (cis / trans))	5	5	1200
Chloroform	5	5	1200
1,2-Dichloroethane	5	5	1200
2-Butanone	25	25	1200
1,1,1-Trichloroethane	5	5	1200
Carbon tetrachloride	5	5	1200
1,1-Dichloropropene	5	5	1200
Bromochloromethane	5	5	1200
Bromodichloromethane	5	5	1200
1,2-Dibromomethane	5	5	1200
1,2-Dichloropropane	5	5	1200
1,3-Dichloropropane	5	5	1200
2,2-Dichloropropane	5	5	1200
1,3-Dichloropropene (cis, trans)	5	5	1200
Trichloroethene	5	5	1200
Dibromomethane	5	5	1200
Dibromochloromethane	5	5	1200
1,1,2-Trichloroethane	5	5	1200
Benzene	5	5	1200
tert-Butylbenzene	5	5	1200
sec-Butylbenzene	5	5	1200
n-Butylbenzene	5	5	1200
trans-1,3-Dichloropropene	5	5	1200
1,2,3-Trichloropropane	5	5	1200
1,2-Dibromo-3-chloropropane	5	5	1200
Isopropylbenzene	5	5	1200
n-Propylbenzene	5	5	1200
1,2,4-Trimethylbenzene	5	5	1200
1,3,5-Trimethylbenzene	5	5	1200



Performance Standard Verification Plan Table PSVP-II Target Compound List (TCL)			
VOLATILES	METHOD REPORTING LIMITS		
	Water µg/L	Low Soil µg/Kg	Med. Soil µg/Kg
Bromoform	10	5	1200
Bromobenzene	10	5	1200
4-Methyl-2-pentanone	25	25	1200
Methyl-tert-butyl-ether	10	5	1200
2-Hexanone	25	25	1200
Tetrachloroethene	10	5	1200
Toluene	10	5	1200
1,1,2,2-Tetrachloroethane	10	5	1200
1,1,1,2-Tetrachloroethane	10	5	1200
Naphthalene	10	5	1200
Chlorobenzene	10	5	1200
1,2-Dichlorobenzene	10	5	1200
1,3-Dichlorobenzene	10	5	1200
1,4-Dichlorobenzene	10	5	1200
1,2,3-Trichlorobenzene	10	5	1200
1,2,4-Trichlorobenzene	10	5	1200
Hexachlorobutadiene	10	5	1200
2-Chlorotoluene	10	5	1200
4-Chlorotoluene	10	5	1200
p-Isopropyltoluene	10	5	1200
Ethyl benzene	10	5	1200
Styrene	10	5	1200
Xylenes (total)	10	5	1200

Performance Standard Verification Plan  
Table PSVP- II continued  
Target Compound List (TCL)

SEMIVOLATILES (Method 8270)	METHOD REPORTING LIMITS		
	Water µg/L	Low Soil µg/Kg	Med. Soil µg/Kg
2,4-Dinitrophenol	25	1650	25000
4-Nitrophenol	5	330	25000
Dibenzofuran	5	330	25000
2,4-Dinitrotoluene	5	330	25000
Diethylphthalate	5	330	25000
4-Chlorophenyl-phenyl ether	5	330	25000
Flourene	5	330	25000
4-Nitroaniline	5	330	25000
4,6-Dinitro-2-methylphenol	5	330	25000
N-nitrosodiphenylamine	25	1650	25000
4-Bromophenyl-phenylether	5	330	25000
Hexachlorobenzene	5	330	25000
Pentachlorophenol	5	330	25000
Phenanthrene	5	330	25000
Anthracene	5	330	25000
Carbazole	5	330	25000
Di-n-butylphthalate	5	330	25000
Fluoranthene	5	330	25000
Pyrene	5	330	25000
Butylbenzylphthalate	5	330	25000
3,3-Dichlorobenzidine	25	1650	25000
Benzo(a)anthracene	5	330	25000
Chrysene	5	330	25000
bis(2-Ethylhexyl)phthalate	5	330	25000
Di-n-octylphthalate	5	330	25000
Benzo(b)fluoranthene	5	330	25000
Benzo(k)fluoranthene	5	330	25000
Benzo(a)pyrene	5	330	25000
Indeno(1,2,3-cd)pyrene	5	330	25000
Dibenzo(a,h,i)anthracene	5	330	25000
Benzo(g,h,i)perylene	5	330	25000

Performance Standard Verification Plan

Table PSVP-II continued

Target Compound List (TCL)

SEMIVOLATILES	METHOD REPORTING LIMITS		
	Water µg/L	Low Soil µg/Kg	Med. Soil µg/Kg
Phenol	5	330	10000
bis(2-Chloroethyl) ether	5	330	10000
2-Chlorophenol	5	330	10000
1,3-Dichlorobenzene	5	330	10000
1,4-Dichlorobenzene	5	330	10000
1,2-Dichlorobenzene	5	330	10000
2-Methylphenol	5	330	10000
2-Methyl-4,6-dinitrophenol	25	1650	10000
4-Methylphenol	5	330	10000
N-Nitroso-di-n-propylamine	25	1650	10000
Hexachloroethane	5	330	10000
Nitrobenzene	5	330	10000
Isophorone	5	330	10000
2-Nitrophenol	5	330	10000
2,4-Dimethylphenol	5	330	10000
bis(2-Chloroethoxy) methane	5	330	10000
2,4-Dichlorophenol	5	330	10000
1,2,4-Trichlorobenzene	5	330	10000
Naphthalene	5	330	10000
4-Chloroaniline	5	330	10000
Hexachlorobutadiene	5	330	10000
4-Chloro-3-methylphenol	5	330	10000
2-Methylnaphthalene	5	330	10000
Hexachlorocyclopentadiene	5	330	10000
2,4,6-Trichlorophenol	5	330	10000
2,4,5-Trichlorophenol	5	330	25000
2-Chloronaphthalene	5	330	10000
2-Nitroaniline	5	330	25000
Dimethyl phthalate	5	330	10000
Acenaphthylene	5	330	10000
2,6-Dinitrotoluene	5	330	10000
3-Nitroaniline	5	330	25000
Acenaphthene	5	330	10000

Performance Standard Verification Plan  
Table PSVP-II continued  
Target Compound List (TCL)

PESTICIDES/AROCLORS	METHOD REPORTING LIMITS	
	Water μg/L	Soil μg/Kg
α-BHC	0.05	0.05
β-BHC	0.05	0.05
δ-BHC	0.05	0.05
γ-BHC (Lindane)	0.05	1.7
Heptachlor	0.05	1.7
Aldrin	0.05	0.05
Heptachlor epoxide	0.05	1.7
Endosulfan I	0.05	1.7
Dieldrin	0.1	3.3
4,4-DDE	0.1	3.3
Endrin	0.1	3.3
Endosulfan II	0.1	3.3
4,4-DDD	0.1	3.3
Endosulfan sulfate	0.1	3.3
4,4-DDT	0.1	3.3
Methoxychlor	0.5	17.0
Endrin aldehyde	0.1	3.3
Chlordane	2.5	85.0
Toxaphene	2.5	85.0
Aroclor-1016	1.5	33.0
Aroclor-1221	1.5	33.0
Aroclor-1232	1.5	33.0
Aroclor-1242	1.5	33.0
Aroclor-1248	1.5	33.0
Aroclor-1254	1.5	33.0
Aroclor-1260	1.5	33.0

Performance Standard Verification Plan Table PSVP-III 8 RCRA Metals List	
ANALYTE	DETECTION LIMIT (mg/L)
Arsenic	1
Barium	10
Cadmium	0.05
Chromium	1
Lead	1
Mercury	0.1
Selenium	0.5
Silver	1

## **APPENDIX C**

### **FINAL FIELD SAMPLING & ANALYSIS PLAN**

**Appendix C**  
**Final Field Sampling and Analysis Plan**  
**Master Metals, Inc. Site**  
**Cleveland, Ohio**

**TABLE OF CONTENTS**

<b>1.0</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	Site Background.....	1
1.2	Past Data Collection Activities .....	2
1.2.1	Compliance Technologies, December 1990 .....	2
1.2.2	Ecology & Environment, July 1992.....	3
1.2.3	Phase I Time Critical Removal.....	3
1.2.4	Phase II Engineering Evaluation and Cost Assessment.....	4
1.3	Statement of Objectives .....	5
1.4	Sampling Activities.....	6
<b>2.0</b>	<b>FIELD SAMPLING ACTIVITIES IMPLEMENTATION.....</b>	<b>8</b>
2.1	Establishment of Coordinate Grid System.....	8
2.2	Sample Identification System .....	8
<b>3.0</b>	<b>SAMPLING PROCEDURES .....</b>	<b>10</b>
3.1	XRF Field Screening.....	10
3.2	Post-Excavation Confirmatory Soil Sampling.....	11
3.3	Treatment Confirmation Samples .....	12
3.4	Sampling of Off-site Fill Materials.....	13
<b>4.0</b>	<b>AIR SAMPLING AND ANALYSIS PLAN.....</b>	<b>14</b>
4.1	High Volume TSP Air Sampling.....	15
4.2	Low Volume Area/Personal Air Monitoring .....	15
4.3	Corrective Measures .....	15
4.3.1	Fugitive Dust Emissions .....	15
4.3.2	Prevention of Fugitive Dust Emissions .....	16
<b>5.0</b>	<b>DATA QUALITY OBJECTIVES .....</b>	<b>17</b>
5.1	Data Quality Needs, Duplicates and Blanks .....	17
5.2	Detection Limit Requirements.....	17
5.3	Chain-of-Custody.....	17
5.4	Sample Shipping .....	18
<b>6.0</b>	<b>FIELD INSTRUMENT MAINTENANCE AND CALIBRATION .....</b>	<b>19</b>
6.1	X-Ray Fluorescence Analyzer .....	19
6.2	Air Sampling/Monitoring Equipment .....	19

**Appendix C**  
**Field Sampling and Analysis Plan**  
**Master Metals, Inc. Site**  
**Cleveland, Ohio**

**TABLE OF CONTENTS continued**

<b>7.0</b>	<b>FIELD DOCUMENTATION .....</b>	<b>20</b>
<b>8.0</b>	<b>REFERENCES .....</b>	<b>21</b>

**List of Figures**

Figure FSAP-1	Historical Soil Sampling Locations
Figure FSAP-2	Site Layout and Soil Sampling Locations

**List of Tables**

Table FSAP-I	List of Parameters and Test Methods by Task
--------------	---

**List of Attachments**

Attachment FSAP-1	XRF Standard Operating Procedure
Attachment FSAP-2	TSP Standard Operating Procedure
Attachment FSAP-3	Area/Personal Low-Volume Air Sampler Standard Operating Procedure



## 1.0 INTRODUCTION

This Field Sampling and Analysis Plan (FSAP) supplements the Quality Assurance Project Plan (QAPP) to the Master Metals, Inc. (MMI) Site Removal Design and Removal Action (RD/RA) Work Plan. This FSAP describes the procedures to be used for collection of samples, including soil, treated material, waste and air samples.

### 1.1 Site Background

The MMI Superfund Site (the "Site") covered under the AOC includes the former MMI lead facility (the "Facility") located at 2850 West Third Street, Cleveland, Cuyahoga County, Ohio and the stockpiled treated soils removed from the surrounding residential property at 1157, 1159 and 1167 Holmden Avenue (the "Holmden Properties") where lead-impacted material from Master Metals was deposited as fill (USEPA, 1999). The Site is situated in Township 7 North, Range 12 West, Section 17,  $\frac{1}{4}$  NE,  $\frac{1}{4}$  SW,  $\frac{1}{4}$  SW, with coordinates obtained from the Facility Index System (FINDS) listed as 41 degrees, 28 minutes, 26 seconds latitude and -81 degrees, 40 minutes, 31 seconds longitude. The site location is illustrated in Figure 1-1 of the RD/RA Workplan.

The MMI property is a triangular-shaped parcel encompassing approximately 4.3 acres in the "flats" area of downtown Cleveland, a heavily industrialized sector of the city. The site is bordered on west by rail yards owned by the Baltimore & Ohio (B&O) Railroad, the east by West Third Street and B&O railroad tracks and on the south by a dead-end road and an abandoned industrial property. LTV Steel owns the property to the south and north. The Cuyahoga River is located approximately 1,250 feet east of the facility and flows north toward Lake Erie (ENTACT, 1999). An athletic field and playground are situated approximately 1,000 feet to the west. The nearest residential property to the former facility is approximately 2,000 feet to the northwest (USEPA, 1999).

Major site features, prior to a 1997-1998 time-critical removal (TCR) action, included an office building, a secondary lead smelting furnace building, two large brick baghouses, the roundhouse building, storage buildings, material storage bins and boxes, and an aboveground storage tank farm (ENTACT, 1998). All buildings, except for the office building attached to the roundhouse in the northern corner of the property, were razed as part of the Phase I TCR (ENTACT, 1998) and all remaining feedstock and debris materials were decontaminated and/or treated and disposed of off-site as either special waste or as hazardous waste (ENTACT, 1998). The roundhouse is not part of the Master Metal Site and is occupied by the railroad preservation society. The MMI facility property is currently vacant with the exception of the roundhouse, and the majority of the open land surface covered with concrete or asphalt except along the site boundaries. Current site features are illustrated in Figure 1-2 of the RD/RA Workplan.

Stormwater drainage is directed toward one of five on-site stormwater catch basins that connect to the combined sewer system operated by the Northeast Ohio Regional Sewer District (NEORS) (ESC, 1991). Locations of the sewers are illustrated on Figure 4-1 of the RD/RA Workplan. Topographic maps suggest that the direction of groundwater flow and surface water flow in the vicinity of MMI is to the northeast toward the Cuyahoga River (ENTACT, 1999).

The MMI facility was constructed in 1932 on slag fill by National Lead Industries, Inc. (NL) who owned and operated the facility as a secondary lead smelter, producing lead alloys from lead-bearing dross and scrap materials. NL Industries also engaged in battery cracking operations at this facility. In 1979, Master Metals purchased the facility from NL Industries and continued to run the secondary lead smelter operations (U.S. EPA, 2001a).

As part of their operations, the Master Metals facility received lead-bearing materials classified and regulated under Resource Conservation and Recovery Act (RCRA) as D008 hazardous waste from off-site sources (USEPA, 2001a). This waste was converted into lead ingots using pot and rotary furnaces equipped with baghouses to collect particulate matter from the furnace that consisted predominantly of lead dust. The sludge that accumulated in the furnaces after smelting was classified as K069 waste hazardous waste. Finished lead ingots were stored in a roundhouse at the north end of the property prior to shipment off-site.

Based on background information, the by-products produced from smelting operations included furnace flux, slag, dross, baghouse fines and furnace sludge (USEPA, 2001a). With the exception of slag, which was tested and disposed of off-site, most of the lead-bearing by-products were recycled back into the furnace. Cooling water used in the operations was diverted to a combined sewer system operated by the NEORD (ESC, 1991).

Violations relating to noncompliance and poor operating practices are documented in various state and federal agency reports, summarized in the Section III of the AOC, presented in Appendix A of the RD/RA Workplan and summarized in Section 1.3.1 of the RD/RA Workplan. On August 5, 1993, as a result of continuing RCRA violations, the Ohio EPA Director ordered MMI to cease operating the facility until it could demonstrate compliance (USEPA, 2001a). Operations never did resume at the MMI facility and Bank One of Ohio took possession of all MMI cash collateral and accounts receivable. The current property owner remains MMI. The former facility president, Mr. Douglas Mickey, is deceased (USEPA, 2001).

## **1.2 Past Data Collection Activities**

Numerous investigations have been conducted by MMI at the facility during 1990 through 1998 to determine the nature and extent of constituents of concern related to former operations.

### **1.2.1 Compliance Technologies, December 1990**

Compliance Technologies, Inc. (CTI) conducted a Phase II environmental assessment of the MMI site from December 3 through December 11, 1990. The investigation included the advancement of 31 soil borings to a maximum depth of 10 feet, and the installation of four monitoring wells to a depth of 15 feet. The purpose of the investigation was to evaluate subsurface and groundwater conditions beneath the MMI facility and determine the impact of prior slag disposal/landfill activities on these media (CTI, 1991b).

Forty-four subsurface soil samples were collected from the 31 borings located in or near the

MMI facility. The samples were collected from depths ranging between two to ten feet below ground surface (CTI, 1991b). The soil samples were submitted to BHM Analytical Laboratory, Chagrin Falls, Ohio and analyzed for the eight RCRA metals (i.e. arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver). The analytical results showed on-site lead concentrations ranging from 18.1 mg/Kg to 14,070 mg/Kg, with lead levels one to two orders of magnitude above the other metals detected. Off-site concentrations of lead in subsurface samples ranged from 7.85 to 55 mg/Kg. Slightly elevated concentrations of chromium and cadmium were observed in only 17 of the 44 samples. Historical sample locations and the associated lead concentrations are shown in Figure FSAP-1.

Based on boring logs, saturated conditions were reported to be present between eight to ten feet below ground surface across the facility. Four groundwater samples were collected from the newly installed monitoring wells on December 28, 1990 using hand bailers and were not filtered. Total lead concentrations ranged between 0.45 mg/L to 1.39 mg/L.

In addition to the soil samples, two samples were collected of the brick and slag material and analyzed for the TCLP 8 RCRA Metals, reactive sulfide, total cyanide, pH and flash point to determine if these materials were hazardous by characteristic (CTI, 1991b). Lead was present in the slag material at 7,075 mg/Kg with leachable lead detected in the slag material at 16.1 mg/L.

### **1.2.2 Ecology & Environment, July 1992**

On July 14, 1992, Ecology and Environment (E&E), on behalf of the U.S. EPA, collected seven surface samples on-site (SS1 - SS7) and three off-site surface soil samples from outside the fence to the east, south and west (SS8 - SS10) as part of a site assessment and hazard evaluation of the MMI facility. All soil samples were submitted to American Environmental Laboratories, Inc. of Bedford, Ohio for analysis of the eight RCRA metals.

Lead concentrations in the on-site surface soil samples ranged from 6,020 to 115,000 mg/Kg. Off-site surface soil samples collected outside the fence showed lead concentrations ranging between 24,000 to 43,100 mg/Kg (E&E, 1992). Sample locations and the associated lead levels are presented in Figure FSAP-1. Once again, lead values were 1-2 orders of magnitude higher than the seven other metals. Some results exhibited minor arsenic, barium, cadmium, and chromium concentrations, relative to the co-located lead concentrations (E&E, 1992).

In July 1992, E&E, on behalf of U.S. EPA, collected samples proximate to the facility property to determine if the facility contaminants were subject to airborne transport. Analysis of these samples (SS8 - SS10) for RCRA metals showed total lead levels of 6,020 - 43,100 ppm. Sample locations and analytical results are illustrated in Figure FSAP-1.

### **1.2.3 Phase I Time Critical Removal**

A Phase I TCR was performed at the Site by ENTACT between June 9, 1997 and January 6, 1998 in accordance with the terms of the AOC Docket number V-W-97-C-402, issued April 17, 1997 by the USEPA Region 5. As part of the time-critical removal, all exposed on-site surface

areas (e.g., not covered by concrete) were excavated to a maximum depth of two feet or until slag fill material (e.g., slag, cinders, etc.) were encountered. XRF information collected from the excavations exhibited lead concentrations up to 39,000 ppm in the remaining slag fill material.

#### **1.2.4 Phase II Engineering Evaluation and Cost Assessment (EE/CA)**

A five-step Phase II EE/CA investigation was conducted by ENTACT in 1998 in accordance with the terms of the AOC Docket number V-W-97-C-402, issued April 17, 1997 by the USEPA Region 5. On-site soil sampling included the advancement of seven borings. Results indicated that 5 of the 7 borings exceeded 1,500-mg/Kg lead at total depth. Historic slag was encountered at approximately three to four feet which is consistent with the information collected during the Phase I TCR (ENTACT, 1998b). The soil sampling locations are illustrated in Figure 1-3 of the RD/RA Workplan.

The on-site sampling indicated that significant lead concentrations, up to 35,000 mg/Kg, remained in on-site soils to a depth of 3 to 4 feet. These areas were either covered with the existing concrete surface or had been excavated and backfilled with 2 feet of clean fill as part of the Phase I TCR. Therefore, in areas where the concrete was competent and in uncovered areas that were excavated as part of the Phase I TCR, the potential for further entrainment of airborne lead had been mitigated and was no longer considered a concern (ENTACT, 1998b). However, a potential for airborne lead releases did exist in areas where the concrete was compromised. These areas were recommended for repair to mitigate this airborne migration route (ENTACT, 1998b).

An off-site perimeter surface soil survey was conducted adjacent to the fence line along the western, eastern and southern boundaries of the MMI facility property using an XRF instrument. Samples were collected at nineteen locations designated in Figure 1-3 of the RD/RA Workplan. Results of the perimeter lead survey showed lead levels ranging from 931 ppm to 36,587 ppm within the upper 12 to 24 inches of soils, decreasing rapidly with depth. The EE/CA found that the surficial elevated lead levels continue to pose a potential ingestion or inhalation threat, and recommended that additional removal action be conducted in these areas (ENTACT, 1998b).

Off-site sampling included the collection of nine off-site surface soil samples along Quigley Avenue. The results showed levels of the average lead concentration to be below the Superfund residential soil screening level of 400 mg/Kg. No further action was recommended (ENTACT, 1998b).

Groundwater sampling conducted in 1991 showed total lead concentrations ranging from 0.45 mg/L to 1.35 mg/L, total chromium concentrations ranging from 0.02 mg/L to 1.33 mg/L and lesser concentrations of arsenic and cadmium (CTI, 1991). Groundwater sampling of the three remaining monitoring wells during the 1998 EE/CA investigation showed the presence of lead, arsenic, cadmium and chromium at levels that have either remained at, or have declined from, the 1991 sampling results. Groundwater is not used as a source of drinking water within a four-mile radius of the site, with Lake Erie supplying the greater Cleveland area with its drinking water supply. Based on the low concentrations of metals in the groundwater and the lack of any potential downgradient receptors, the groundwater migration pathway was eliminated as a concern (ENTACT, 1998b).

The EE/CA assessment verified that lead was the predominant hazardous constituent of concern at the site, with lesser occurrences of arsenic. Removal action directed at lead exceedences would also address the co-located elevated levels of arsenic. Based on a streamlined risk evaluation, a risk-based remediation goal (RBRG) for lead of 1,000 mg/Kg was established for on-site and off-site perimeter soils (ENTACT, 1998b). This final removal action has been designed to address the remaining lead impacts defined in the EE/CA and associated with former facility operations.

### **1.3 Statement of Objectives**

Based on the findings of the Phase II EE/CA, an Action Memorandum was signed by the USEPA on September 22, 2000 and an Administrative Order of Consent (AOC) was entered into between the USEPA and the PRP Respondent Group on September 25, 2002 to perform a non-critical removal action, as described in the Statement of Work (SOW) to address remaining lead impacts at the site that are associated with former facility operations. The September 25, 2002 AOC is presented in Appendix A of the RD/RA Workplan.

- Clear and grub areas requiring excavation of all trees and brush for disposal off-site.
- Demolish applicable above-grade concrete and metal structures remaining on-site after the Phase I TCR demolition activities as detailed in the design specifications. Sized concrete construction debris will either be used as a sub-base material in unpaved areas to be covered with the asphalt cover or will be transported off-site disposal as construction debris. All wood, bricks or metal debris that are removed will be disposed of off-site as construction debris.
- Establish a coordinate grid system along the perimeter of the property outside the fence line and in on-property areas where excavation is required.
- Excavate off-property soils along the western, eastern and southern perimeter of the MMI facility, that exceed the RBRG of 1,000 mg/Kg or until historic slag fill material is encountered, whichever comes first. XRF screening technology will be used to guide the depth of the excavations during removal with confirmational laboratory analysis.
- Excavate designated on-property soils that are not under concrete or the proposed asphalt cover (including grids I1, J1 and K1 excavated during the Phase I TCR) that exceed the RBRG of 1,000 mg/Kg or until historic slag fill material is encountered, whichever comes first.
- Conduct laboratory confirmatory soil sampling from the excavation floor in grids where the excavation was terminated prior to reaching the historic slag fill material to confirm that all soils (other than historic slag) that are above the cleanup level have been excavated and removed.
- Backfill all excavated areas once verified to have met the RBRG or have reached historic slag fill, and grading to promote positive drainage in accordance with the design documents. Backfill for areas not covered by asphalt or concrete will be filled with clean imported fill material confirmed with confirmational laboratory analysis that has been approved for use based

on analytical results and is suitable to maintain vegetative growth.

- Stabilize excavated soils to meet the applicable LDRs for contaminated soils for lead, and any underlying hazardous constituent (UHC) during waste profiling, to render the material nonhazardous for either use as fill in low areas beneath the proposed asphalt cover or for off-site disposal at an approved Subtitle D facility.
- Conduct laboratory verification sampling of treated soils using TCLP lead analysis to verify the material has been rendered non-hazardous for lead prior to either placement in low areas beneath the proposed asphalt cover or for off-site disposal as nonhazardous waste.
- Off-site disposal of all treated soils not placed beneath the proposed asphalt cover, in accordance with the SOW and the approved design plan.
- Place an asphalt cover over the deteriorated area of the concrete and non-concrete areas located in southern portion of the site in accordance with the design documents. The base course under the asphalt in the non-concrete areas (pits and brick road) will conform to ODOT specifications for pavement design and rehabilitation in accordance with the Final Design Documents.
- Recondition existing concrete surfaces not under the asphalt cover by sealing any significant cracks and breaks that extend through the concrete surface, followed by encapsulation of the concrete surface, in accordance with the approved design plan. Significant cracks are defined as fully penetrating the concrete surface with a width greater than ½ inch.
- Abandon of all existing monitoring wells on site in accordance to applicable State of Ohio regulations (OAC-3745-9-10 ).
- Remove any existing solid waste including Investigative Derived Waste (IDW) from previous or current removal actions.
- Install a 6-foot high perimeter chain-link fence and three double-swing gates at the completion of the RA to control site access at the site in accordance with the design documents.
- Development of an Operation and Maintenance (O&M) Plan to ensure the integrity of the remedy by maintaining and repairing the concrete and asphalt cover, and the perimeter fencing for a period of thirty (30) years, and as specified in the AOC.

## **1.4 Sampling Activities**

This FSAP for the Remedial Action at the MMI Site will be implemented for the following types of samples:

- Air Samples
- Excavation Confirmatory Soil Samples
- X-Ray Fluorescence Field Screening Samples

- Treated Material Verification Samples
- Imported Backfill Characterization Samples

The objectives of these sampling activities include:

- Direct removal action tasks;
- Verification of that removal criteria have been achieved;
- Verification of treated soils for on-site placement; and
- Collection of data to determine if implementation of the Contingency Plan is necessary due to constituent concentrations in air or surface water.

## 2.0 FIELD SAMPLING ACTIVITIES IMPLEMENTATION

### 2.1 Establishment of Coordinate Grid System

A coordinate grid system (CGS) will be established in order to provide a coordinate system for tracking sampling and excavation activity in the field. The approximate location of the CGS for the impacted area to be delineated is presented on Figure FSAP-2. The CGS will employ square grids of 50 feet by 50 feet superimposed completely over the impacted area. Wooden stakes and/or spray paint will be used to make the actual marking of the grid corners in the field. ENTACT will install wooden stakes or metal posts to delineate benchmarks so that the grids can be easily relocated in the field should remedial activities disrupt grid markings or stakes. This coordinate system will be used to provide reference markers for 1) confirmatory soil sampling, and 2) XRF field-screening activities.

### 2.2 Sample Identification System

A sample identification system will be implemented in order to properly track sampling activities. The sampling activities and examples of the identification coding system associated with each type are listed below with a following explanation:

Samples Type	Identification System
<b>Air Samples:</b>	
TSP High Volume Samples	TSP-Unit#-001
Personal/Area Low Volume Samples	PAS-Unit#-001
<b>Soil Samples:</b>	
X-Ray Fluorescence Field Screening	X-01-1
Post-Excavation Confirmatory Samples	V-01-2.0'
Treated Material-Confirmation (TCLP) Samples	TS-001
Imported Backfill Samples	BF-001
<b>Waste Characterization Samples:</b>	
Solid Waste (general waste and stabilized soils if off-site disposal is needed)	W-001
Wastewater (not used for dust control measures)	WW-001



<b>Quality Control Samples:</b>	
Field Duplicate Samples for Soil, Treated Material	V-01-2.0' D TS-001D
Field Rinsate Blanks	FB-001

All numbering sequences shown above with "001" will begin with the number "001" and will continue sequentially (i.e., FB-001, FB-002, etc.; TSP-1-001, TSP-1-002, etc.) until the final samples for the removal action are collected. Air monitoring samples will include the type and station number to identify which air station the measurement was recorded on. For example, TSP-2-002 will indicate the second measurement on TSP Station No. 2.

X-Ray Fluorescence (XRF) excavation samples will be numbered for incorporation into the XRF log-in database. The samples will be numbered with the grid identification number and the specific screening location within the grid. The grid numbering system is explained in the following section. For example, an XRF sample obtained from an excavation in Grid 1, from the third location out of four within the grid, will be designated X-01-3. For a reverification of the same location, a, b, c, etc will follow the sample identification code.

If excavation is terminated prior to reaching the historic slag fill, a confirmatory soil sample will be collected to verify that the RBRG has been achieved. These confirmation samples to be sent to the approved laboratory will be obtained as a single grab sample from within that grid. Each soil sample will be numbered with the unique grid identification number and the sampling depth from ground surface. For example, a post-excavation confirmation sample obtained from the excavation in Grid 1 at 2 feet below original grade, will be designated V-01-2.0'

### **3.0 SAMPLING PROCEDURES**

#### **3.1 XRF Field Screening**

The purpose of the XRF field screening is to guide the extent of the excavation until either the RBRG is achieved or until historic slag is encountered. The XRF data will not be used to verify or evaluate the achievement of any performance standard or criteria at the site. XRF screening will only be used to assist in conducting the removal activities at the site.

The following procedures describe the overall sampling process during the XRF field screening.

- a. The sampling team will adhere to the Health and Safety Plan requirements.
- b. The XRF will be used to obtain measurements at four locations per each grid designated for excavation in one-foot increments. These four locations will be determined based on spatial distribution, or visual observations.
- c. If the XRF results indicate that the lead is below 1,000 mg/Kg total lead before the historic slag is encountered, excavation will be terminated and a confirmatory sample will be collected to verify that the action level has been achieved for that grid as described in Section 3.2 of the FSAP.
- d.. If XRF screening results reveal lead-impacted material above the clean-up criteria of 1,000 mg/Kg, then excavation will continue in one-foot increments with XRF screening conducted at each one-foot increment until the maximum depth interval is reached (i.e., when the historic slag is encountered, typically between 3 and 4 feet below ground surface)

#### ***XRF Field Screening Methodology***

ENTACT's XRF Standard Operating Procedures (SOP) is presented in Attachment FSAP-1 of the FSAP. XRF analysis for total lead on soil and solid media will be performed as follows:

- a. Sampling teams will adhere to the Health and Safety Plan requirements.
- b. An approximate 6-inch by 6-inch square area on the excavation floor will be cleared of any stones or debris and flattened with a trowel, with care being taken to remove as little surficial soil as possible, to provide a flat area for XRF analysis as described in Section XIII (A) of the XRF SOP.
- c. The XRF probe will be placed on the flat, compacted soil surface, activated and held in place for the 60-second scanning period.
- e. One measurement will be collected in each grid quadrant, and these readings will be written into the field logbook. If any of the four XRF readings collected in the grid indicate that the

lead is present above 1,000 mg/Kg, excavation across the entire grid will continue.

- f. The sample identification number for each measurement will be entered into the unit's computer memory and saved along with the result. The data will then be downloaded onto a computer hard disk file at end of each day. The results will also be written into the field logbook.

### **3.2 Post-Excavation Confirmatory Soil Sampling**

If the excavation was terminated before historic slag was encountered, ENTACT will collect one (1) grab confirmatory soil sample. One grab sample will be collected from the excavation floor in each grid at a depth of 0 to 3 inches. If the historic slag is encountered prior to achieving the RBRG of 1,000-mg/Kg lead, the excavation will be terminated and no confirmatory sample will need to be collected from the excavation floor.

All confirmatory samples will be submitted to the approved laboratory for total lead analysis by EPA Method 6010B. Analytical parameters and test methods are presented on Table FSAP-1. Post-excavation confirmatory soil samples to be submitted for laboratory analysis will be performed as follows:

- a. The sampling team will adhere to the Health and Safety Plan requirements.
- b. Designated sampling locations will be identified. Photographs will be maintained to document sample locations.
- c. Staging areas for sample collection will be established. Clean, plastic-holding containers will be placed adjacent to the areas to be sampled during sample collection. The following tools and supplies will be prepared for use:
  - Field Logbook;
  - Plastic or glass laboratory-supplied sample containers;
  - Stainless steel or plastic disposable trowels;
  - Zip-Lock bag or equivalent sample bags or stainless steel bowl;
  - Measuring tape;
  - Paper plates;
  - Distilled water, low-phosphate detergent, and brushes;
  - Disposable gloves;
  - Trash bags; and
  - Three 5-gallon buckets to carry equipment and for decontamination liquids if reusable sampling equipment is used.
- d. A sufficient amount of soil will be retrieved by sample trowel, placed into a clean Zip-lock bag or stainless bowl and mixed to achieve a homogeneous sample then transferred to the sample containers.

- e. Field notes will be completed and will include identification of the soil sample number, time and date of collection, color, and brief description.
- f. Chain-of-custody documents will be prepared according to procedures outlined in Sections 4.1.2.4. and 5.0 of the QAPP. Sample containers will be labeled in accordance with the predetermined sample numbering system, and sealed in a plastic bag for shipment to the laboratory for analysis.
- g. All reusable sampling equipment will be decontaminated utilizing a detergent wash and potable water rinse, followed by a distilled water rinse and drying with disposable towels between each sampling event. All disposable sampling media will be placed into designated site containers.

### **3.3 Treatment Confirmation Samples**

Treated material will be sampled and analyzed for toxicity characteristic leaching procedure (TCLP) lead and any identified underlying hazardous constituent (UHC). The frequency of sampling will be one (1) composite sample consisting of seven aliquots from every 250 cubic yards of treated material for the first 1,000 cubic yards, then one composite sample of seven aliquots for every 500 cubic yards, thereafter. Soils that exhibit the toxicity characteristic for lead will be treated to render the waste non-hazardous i.e., less than 5.0 mg/L TCLP lead and meet the LDR of < 7.5 mg/L TCLP lead. The LDRs will also be met of any underlying UHC. Soils will be sampled and analyzed for TCLP lead by EPA Method 1311/6010B or 1311/6020. Analytical parameters and test methods are shown on Table FSAP-1. The following field methods will be utilized for these sampling efforts:

- a. The sampling team will adhere to the Health and Safety Plan requirements.
- b. A sufficient amount of material will be retrieved by sample trowel and placed into a clean, stainless steel or plastic bowl or Zip-Lock bag or equivalent and mixed well. The sample will then be inserted into the sample containers.
- c. Field notes will be completed and will include identification and storage location of the batch being sampled, sample number, data and other pertinent information.
- d. Chain-of-custody documents will be prepared, sample containers will be labeled in accordance with the predetermined identification system and samples will be sealed and shipped to the laboratory for analysis.
- e. All re-usable sampling equipment will be decontaminated utilizing a detergent wash and potable water rinse, followed by a distilled water rinse and drying with disposable towels between each sampling event. All disposable sampling media will be placed into designated waste containers.

### **3.4 Sampling of Off-site Fill Materials**

Samples of fill material brought in from offsite sources will be collected according to the following procedures. Initially, each source of fill material will be sampled once for the eight RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver), volatile organic compounds (VOCs), pesticides/PCBs, and total petroleum hydrocarbons (TPH). If TPH levels exceed the OEPA petroleum fraction residual saturation concentrations listed in Table I under Ohio Rule 3745-300-8 (8 to 40 mg/Kg for glacial till or silty clay soils), the fill will be sampled for semi-volatile organic compounds (SVOCs). Analytical results of the backfill material will be submitted to the USESPA for review prior to use as backfill on-site.

The VOC sample will be collected as a grab sample and will not be homogenized. Four separate grab samples will be collected from the source area since compositing cannot be accomplished. The remaining sample parameters will be collected from a composite sample consisting of seven aliquots obtained from the source area or stockpiled material from the source area. Sample test methods and sample container requirements are listed on Table FSAP-1. The source location of the backfill material will be documented by source location and address. Sampling will then be performed on every additional 10,000 cubic yards from the same source area by grab sample for total lead. The backfill samples will be collected as follows:

- a. The sampling team will adhere to the Health and Safety Plan requirements.
- b. A sufficient amount of material will be retrieved by sample trowel and placed into a clean, stainless steel or plastic bowl or Zip-Lock bag or equivalent and mixed well. The sample will then be inserted into the sample containers.
- c. Field notes will be completed and will include identification and storage location of the batch being sampled, sample number, date and time collected and other pertinent information.
- d. Chain-of-custody documents will be prepared, sample containers will be labeled in accordance with the predetermined identification system and samples will be sealed and shipped to the laboratory for analysis.
- e. All sampling equipment will be decontaminated utilizing a detergent wash and potable water rinse, followed by a distilled water rinse and drying with disposable towels between each sampling event. All disposable sampling media will be placed into designated site containers.

## 4.0 AIR SAMPLING AND ANALYSIS PLAN

Air monitoring will be conducted on site to ensure that all personnel and local residents are not exposed to levels of particulate matter or airborne lead concentrations in excess of the regulated limits, and to ensure that contaminants are not migrating off site. For this project, Clean Air Act monitoring methodologies will be employed to monitor for respirable dust and lead emissions in addition to the OSHA defined air monitoring. Air sampling equipment to be used as part of the removal action include the use of perimeter high volume monitors (i.e., Total Suspended Particulate (TSP) and low volume personal/area air monitors. Standard operating procedures for the air samples used is presented in Appendices FSAP-2, and FSAP-3. The air-monitoring program designed to protect worker safety is detailed in Section 7.0 of the Health and Safety Plan.

Two types of air samples will be used at the site, and analyzed at the laboratory. These consist of high volume total suspended particulate air sampler for analysis of total particulate and total lead, and low volume personal/area air monitors. A list of the sample parameters and test methods are presented on Table FSAP-1. Baseline air monitoring will begin one week prior to the initiation of the removal action and will be conducted on a regular basis (minimum of four times daily) for a full work week (Monday through Friday). Fugitive air emission monitoring will then be conducted during soil excavation, handling and backfilling operations in accordance with the Health and Safety Plan.

TSP air sampling stations will be established around the perimeter of the Removal Action area consisting of a minimum of one upgradient and two downgradient locations. Locations will be chosen based on local wind data, so as to provide for upwind and downwind concentrations of dust and lead.

Every attempt will be made to maintain the following siting recommendations regarding location of the high-volume samplers:

- a. Sampler should be at least 60 feet from trees, buildings, or other large obstacles. A general placement rule is that the sampler should be located at least twice as far away from the obstacle as the height of the obstacle.
- b. Sampler inlet should be 6 to 21 feet above the ground surface.
- c. Sampler must have unrestricted air flow.
- d. Sampler inlet should be at least 6 feet from any other high-volume sampler inlet.
- e. The sampler cannot be placed directly upon the ground.
- f. The sampler cannot be placed near exhaust flues or vents.

Final TSP locations will be determined during site mobilization based upon site logistics (electrical

source, accessibility, etc.) and prevalent wind directions.

## **4.1 HIGH VOLUME TSP AIR SAMPLING**

TSP air samples will be collected to determine total suspended particulate concentrations in accordance with the SOW. The TSP samplers will be operated continuously over 24-hour periods, except for brief down time periods due to change out of filters or repositioning of the samplers.

The samplers will be assembled according to manufacturer's instructions and attached to a stand. The filter disks will be changed each day. Filters will be sent to Pace Analytical in Indianapolis, Indiana every fifth working day for total lead analysis as well as total mass collected. Filters sent in for laboratory analysis will be submitted with a request for 24-hour turnaround of analytical services.

Conditions at the site will be maintained such that the action level of  $187.5 \mu\text{g}/\text{m}^3$  is not violated at the site perimeter. The action level was derived from one half of the National Ambient Air Quality Standards (NAAQS) for particulate matter of  $150 \mu\text{g}/\text{m}^3$  converted to a one hour averaging period (USEPA, 2001). Air samples will also be analyzed for total lead during the removal action so as to maintain the NAAQS for lead particulate of  $1.5 \mu\text{g}/\text{m}^3$  for a 24-hour average of lead (based on a quarterly average) throughout the duration of the removal action.

## **4.2 LOW VOLUME PERSONAL/AREA AIR MONITORING**

Air quality samples will be collected to determine the amount of antimony, arsenic, cadmium, and lead in the air for worker safety. These samples will be collected with five (5) low volume-sampling pumps and sample cassettes. The sampling pump will be positioned upon personnel or in or near areas of potential fugitive dust emissions generation. Low volume personal/area air monitoring is described in detail in Section 7.1.4 and 7.1.5 of the HASP. The SOP for the personal is presented in Attachment FSAP-3.

## **4.3 CORRECTIVE MEASURES**

The air monitoring methodologies described above will dictate engineering controls to ensure worker safety and that no potential impacts occur to surrounding residential areas. Corrective measures relating to spills, emergency contacts and response operations are described in the Contingency Plan included with the HASP.

### **4.3.1 Fugitive Dust Emissions**

Air dispersion of contaminated soil may occur from mechanical agitation of soil by earth moving or soil treatment equipment. Air quality around the workplace will be monitored throughout the project by stationary air monitoring devices located around the perimeter of the site to determine on site air contamination. The action level for lead concentration in the ambient air is  $1.5 \mu\text{g}/\text{m}^3$ .

#### **4.3.2 Prevention of Fugitive Dust Emissions**

Adequate dust control measures will be implemented throughout the project. Personal/area and stationary sampling devices will provide actual airborne concentration data for lead and particulate matter. If dust generation is observed, the operation will be suspended or modified until corrective measures are taken to reduce the fugitive dust emission. Corrective measures may include wetting the area of concern, application of a surfactant to the contaminated surfaces, and/or filtering or otherwise controlling contaminated air.



## **5.0 DATA QUALITY OBJECTIVES**

### **5.1 DATA QUALITY NEEDS, DUPLICATES, AND BLANKS**

A combination of two levels of data quality objectives will be utilized in this project to address field screening and laboratory analytical data. Data Quality Objective Level 1, field-screening methods will be used for the XRF screening activities. Data Quality Objective Level 4 samples will be used for samples analyzed in the laboratory for confirmation of the clean up criteria and treatment prior to placement on-site and consolidation. Samples will be analyzed for the total lead or TCLP lead as outlined in the QAPP.

Rinsate blanks and field duplicates will be collected at a ten percent frequency interval for field quality assurance (QA) and quality control (QC), as well as laboratory QA and QC to be performed for all samples submitted to the laboratory. The laboratory QA/QC includes one matrix spike and one matrix spike duplicate (MS/MSD) for every 20 samples. A complete description of all QA/QC procedures is presented in the Quality Assurance Project Plan (QAPP) (Appendix D of the RD/RA Workplan).

### **5.2 DETECTION LIMIT REQUIREMENTS**

The level of concern for each parameter directly affects the data quality requirements. Therefore, the sampling and analysis methods must be accurate at the level of concern. Furthermore, it is necessary that the analytical technique chosen has a detection limit well below the level of concern. Analytical methods that can accurately quantify constituents below their levels of concern will be used for the MMI sample analyses. The detection limits will generally be much less than the levels of concern. It is necessary that data quality objectives be consistent with clean-up levels or other levels.

Analytical detection limits should be less than the level of concern for each constituent and will be selected so that any analyzed parameter result can be compared to the appropriate level. The QAPP discusses the planned detection limits for analyses along with the methods to be used for this investigation in order to address the various levels for comparison.

### **5.3 CHAIN-OF-CUSTODY PROCEDURES**

Proper documentation of sample collection and the methods used to control these documents are referred to as Chain-of-Custody (COC) procedures. COC procedures are essential for presentation of sample analytical results as evidence in litigation or at administrative hearings conducted by regulatory agencies. COC procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples. Section 5 of the QAPP describes all COC procedures for both field use and laboratory use. An example COC record form is also presented in the QAPP (Appendix D of the RD/RA Workplan).

## 5.4 SAMPLE SHIPPING

For shipping, all samples will be packaged in such a manner as to prevent damage or breakage during shipment or transport. For backfill samples that include VOC or SVOC analyses, the samples will need to be stored on ice during collection and shipment. Sampling personnel will ship samples not delivered to the laboratory through an overnight parcel service. Samples will be placed into suitable containers, labeled and sealed in such a manner that tampering with the seal would be obvious. All sample holding times will be tracked and a copy of the Chain-of-Custody form will accompany the samples in a sealed plastic bag. Sample shipping is discussed in Section 4.3 of the QAPP (Appendix D of the RD/RA Workplan).

## **6.0 FIELD INSTRUMENT MAINTENANCE AND CALIBRATION**

### **6.1 X-RAY FLUORESCENCE ANALYZER**

The Spectrace 9000 energy dispersive X-Ray Fluorescence analyzer will be the instrument utilized for screening total lead concentrations in soil. The Spectrace 9000 instrument utilizes three radioisotope sources. Each source emits a different energy (wavelength) of radiation, which provides efficient analysis of specific ranges of elements. A 60-second scan time will be utilized for the duration of the Removal Action. Only qualified analysts trained in the proper use, theory, and safety of XRF analysis will operate this system.

The principle of XRF analysis is based on electron excitation. Elemental atoms in a soil sample are irradiated with a beam of x-rays. Electrons in the atoms at lower lying energy levels are excited to higher energy levels. The vacancies left in the inner electron orbital make the atom unstable. Relaxation to the ground state occurs, resulting in the emission of x-rays characteristic of the excited elements. Thus, by examining the energies of the x-rays emitted by the irradiated soil sample, identification of elements present in the sample is possible. Comparing the intensities of the x-rays emitted from a given sample to those emitted from reference standards with known analyte concentrations allows quantification of the elements present in the samples. Prior to any on-site activities, the Spectrace 9000 will be properly calibrated in order to allow for accurate sample analysis. Calibration specific response factor/calibration study will be done to verify the concentrations of lead in soils as discussed in Section XI (A) of Attachment FSAP-1 (XRF SOP). During on-site activities, the XRF will be standardized daily utilizing referenced standards for quality assurance and quality control.

### **6.2 Air Sampling/Monitoring Equipment**

#### ***TSP air sampler***

The TSP air sampler collects air samples using a high-volume vacuum pump to pull air through a filter, depositing airborne agents on the filter. A SOP for the TSP air sampler is presented in Appendix FSAP-2 and includes instrument calibration, sample collection, and routine preventive maintenance.

#### ***Personal/area low volume air sampler***

The low volume air sampler collects air samples using a low-volume vacuum pump to pull air through a filter cassette, depositing airborne agents on the filter. An SOP for the area and personal low-volume sampler is presented in Appendix FSAP-3 and includes instrument calibration, sample collection, and routine preventive maintenance.

## **7.0 FIELD DOCUMENTATION**

Logs of daily activities will be used to record sampling activities. Since there will be several different types of sampling activities going on (e.g., air, XRF, soil, treated material, backfill), possibly at the same time, there may be several log books. These books will be bound and have consecutively numbered pages. Entries in the field logbook will be made in ink and will include: the name of the author; date and time of entry; location of activity; sample collection or measurement methods; number of samples collected; sample identification numbers; field observation and comments; sampling depth increment for soils; field measurements; locations of photographs; and any deviations from the sampling plan. The field logbook will be stored in the document control center at the job site when it is not in use. Upon project completion, all logbooks will become part of the file records.

TABLE FSAP-1: LIST OF PARAMETERS AND TEST METHODS BY TASK, FIELD SAMPLING AND ANALYSIS PLAN,  
Master Metals Inc. Site, Cleveland, Ohio

Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
<b>Pre-Excavation and Post-Excavation Confirmation</b>								
Total Lead	XRF <sup>(3)</sup>	na	Soil	Four locations per grid for screening purposes only	Field Test	na <sup>(4)</sup>	na	na
Total Lead	SW-6010B <sup>(1)</sup>	SW-3050	Soil	One (1) grab confirmation sample per grid cell if historic slag is not encountered	P/G <sup>(2)</sup>	None	100 g	6 months
<b>Soil Treatment Confirmation</b>								
TCLP Lead <sup>(5)</sup>	SW-6010B	SW-1311	Soil	1 per 250 cubic yards for first 1,000 cubic yards, then at intervals of 500 cubic yards thereafter	P/G	None	250 g	6 months
<b>Air Monitoring</b>								
Total Suspended Particulate (TSP)	40CFR Part 50, Ap. B	40CFR Part 50, Ap. B	Air	Daily – filter disks changed daily (4) (Three TSP monitors around perimeter of site)	Filter	na	na	na
Total Suspended Particulate (TSP) for Lead	40 CFR Part 50, App. G	40 CFR Part 50, App. G	Air	Daily – filter disks changed daily (4) (Three TSP monitors around perimeter of site)	Filter	na	na	na
Total Lead by low-vol sampler	NIOSH 7300 7105 7082	NIOSH 7300 7105 7082	Air	Daily	Filter cassette	na	na	na
Random Air Monitoring (RAM)	Instrument specific	Instrument specific	Air	Daily	Real-time	na	na	na

TABLE FSAP-1 continued: LIST OF PARAMETERS AND TEST METHODS BY TASK, FIELD SAMPLING AND ANALYSIS PLAN,  
Master Metals Inc. Site, Cleveland, Ohio

Imported Backfill Material								
Test Description	Test Method	Extraction Method	Matrix	Frequency	Container	Preservation	Sample Size	Maximum Holding Time
Total Arsenic	SW-6010 <sup>(1)</sup>	SW-3050	Soil	Initial, 1 7-part composite sample per source	P/G <sup>(2)</sup>	None	4 oz jar	6 months
Total Barium	SW-6010	SW-3050	Soil	same as above	P/G <sup>(2)</sup>			6 months
Total Cadmium	SW-6010	SW-3050	Soil	same as above	P/G			6 months
Total Chromium	SW-6010	SW-3050	Soil	same as above	P/G			6 months
Total Lead	SW-6010	SW-3050	Soil	same as above	P/G			6 months
Total Mercury	SW-7471	SW-3050	Soil	same as above	P/G			28 days
Total Selenium	SW-6010	SW-3050	Soil	same as above	P/G			6 months
Total Silver	SW-6010	SW-3050	Soil	same as above	P/G			6 months
Volatile Organic Compounds (VOCs)	SW-8260B	SW-5030	Soil	4 grab samples per source	G	Cool, 4C, HCl, No HS	3 - 40 ml vials	14 days
Total Petroleum Hydrocarbons (TPH)	SW-8015 Modified DRO	SW-3054, 3055, 5030	Soil	Initial, 1 7-part composite sample per source	G	Cool, 4C	250 g	Ext. 14 days Anal - 40 days
Pesticides & PCBs	SW-8081	SW-3540/50	Soil	same as above	P/G	Cool, 4C	250 g	14 days

Notes:

- (1) Sample Test Method designated as SW-xxxx is from EPA SW-846.
- (2) P/G - Plastic or Glass
- (3) XRF - X-Ray Fluorescence Analyzer<sup>(6)</sup>
- (4) Analyze 1 filter every 5 days and, if RAM indicates a daily average exceeding 0.15 mg/m<sup>3</sup>.
- (5) TCLP - Toxicity Characteristic Leaching Procedure  
na: not applicable

Figure FSAP-1  
HISTORICAL SOIL SAMPLING LOCATIONS

Description	Sample I.D.	Boring Depth	Total Pb Result (ppm) & Sample Depth (Ft.)
Slag	B-1	Refusal @ 4'	23 (2-3)
Slag	B-2	Refusal @ 4.5'	28 (2-3)
Slag	B-3	Refusal @ 5'	38 (2-3)
Slag	B-4	Refusal @ 5'	36 (2-3)
Brown Sand/Brick	B-5	6" Concrete Refusal @ 4.5'	17 (2-3) 18 (8-10)
Slag	B-6	6" Concrete Refusal @ 4.5'	40 (2-3) 32 (4-5)
Slag	B-7	6" Concrete Refusal @ 5'	2,625 (3)
Slag	B-8	6" Concrete Refusal @ 5'	1,400 (3)
Slag	B-9	4" Concrete Refusal @ 5'	3,825 (3)
Sand/Brick	B-10	12'	970 (3-5) 11,825 (8-10)
Sand/Silt/Clay	B-11	10'	11,175 (3-5) 3,500 (8-10)
Sand/Clay	B-12	10'	52 (3-5) 1,200 (8-10)
Sand	B-13	6" Concrete Refusal @ 10'	975 (3-5) 650 (8-10)
Sand/Silt/Clay	B-14	6" Concrete Refusal @ 10'	125 (3-5) 105 (8-10)
Sand	B-15	8" Concrete Refusal @ 10'	500 (3-5) 165 (8-10)
Sand/Silt/Clay	B-16	10'	15 (3-5) 8 (8-10)
Sand/Silt/Clay	B-17	10'	18 (3-5) 33 (8-10)
Sand/Silt/Clay	B-18	10'	22 (3-5) 15 (8-10)
Sand/Silt/Clay	B-19	10'	128 (3-5) 63 (8-10)
Slag	B-20	Refusal @ 5'	55 (4)
Slag	B-21	4" Concrete Refusal @ 10'	102 (8-10)
Slag	B-22	4" Concrete Refusal @ 5'	352 (3-5)
Slag	B-23	4" Concrete Refusal @ 1.5'	No Information Available
Slag	B-24	6" Concrete Refusal @ 2.5'	4,960 (2)
Sand/Silt/Clay	B-25	6" Concrete Refusal @ 10'	5,010 (3-5) 650 (8-10)
Slag	B-26	8" Concrete Refusal @ 7'	1,120 (3-5)
Slag	B-27	6" Concrete Refusal @ 1.5'	14,070 (1)
Slag	B-28	6" Concrete Refusal @ 5'	1,300 (4-5)
Slag/Sand	B-29	6" Concrete Refusal @ 5'	225 (3-5)
Slag/Coal	B-30	6" Concrete Refusal @ 10'	1,260 (3-5) 32 (8-10)
Slag	B-31	Refusal @ 5'	229 (5)
Trench Drain Sediment	SS1	Near Surface	115,000 + TCLP 1,230
Trench Drain Sediment	SS2	Near Surface	8,610 + TCLP 1,040
Surface Soil	SS3	Near Surface	98,000 + TCLP 1,220
Surface Soil	SS4	Near Surface	6,020 + TCLP 3.3
Low Area Sediment	SS5	Near Surface	78,340 + TCLP 959
Surface Soil	SS6	Near Surface	94,000 + TCLP 1,060
Surface Soil	SS7	Near Surface	107,000 + TCLP 1,260
Surface Soil	SS8	Near Surface	24,000 + TCLP 6.3
Surface Soil	SS9	Near Surface	24,200 + TCLP 6.3
Surface Soil	SS10	Near Surface	43,100 + TCLP 757

NOTES:

- Site Plan Not To Scale

- Site Features And Boring Locations are Approximate

I. E. G. E. N. D.

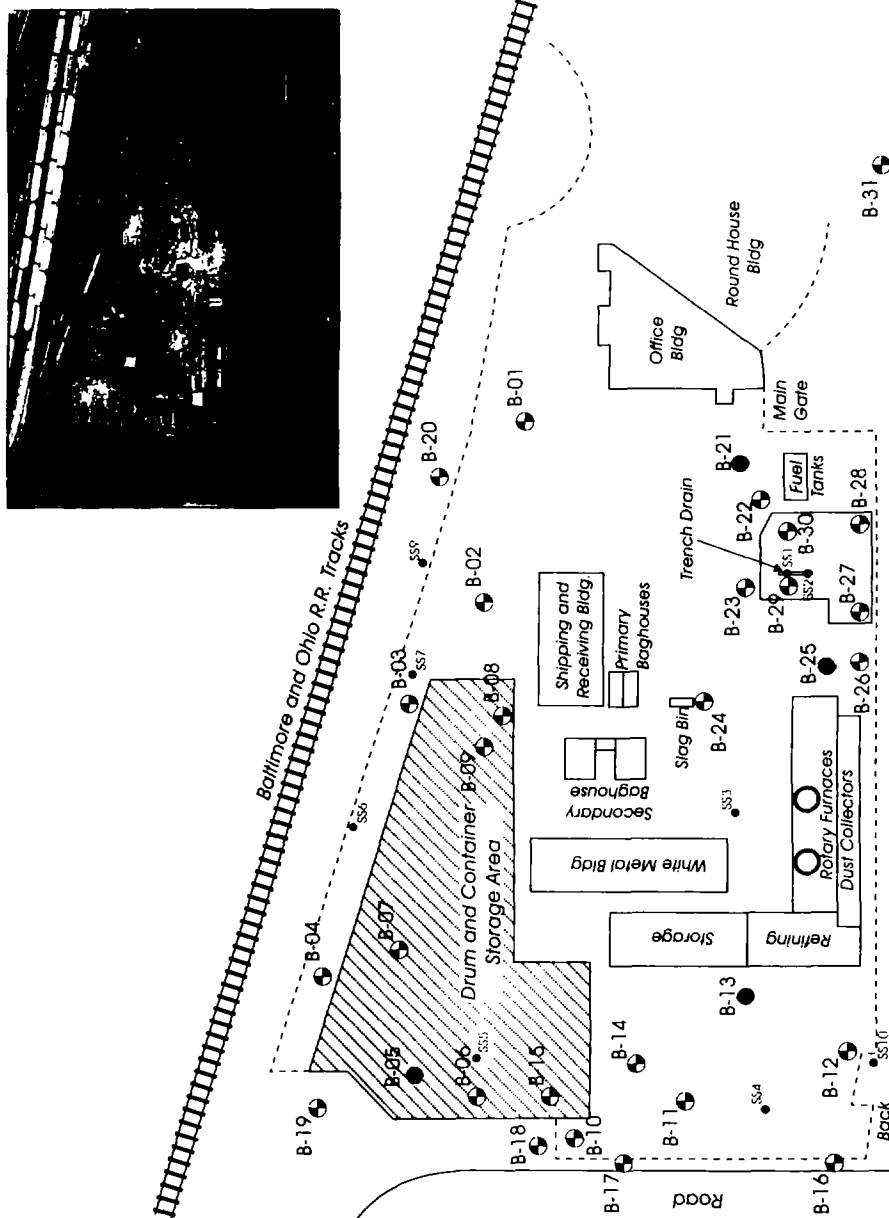
● Boring Location - C.T.I. 1990

● Boring Location/Monitoring Well - C.T.I. 1990

● Surface Grab Sample Location - E & E, 1992

Fence

Railroad Tracks



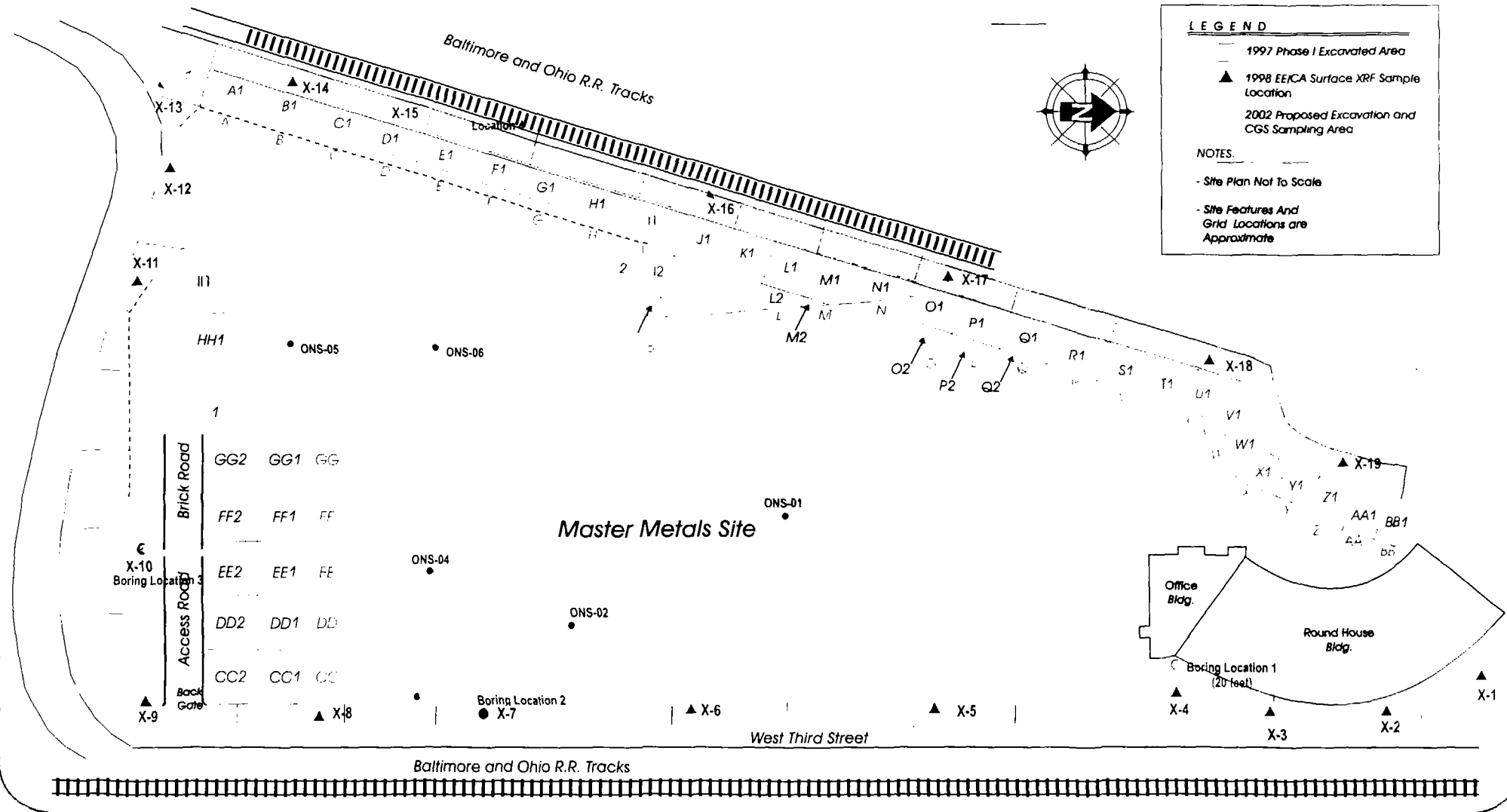
West Third Street

Battery Storage Area

Baltimore and Ohio R.R. Tracks

**MASTER METALS  
SITE**  
Cleveland, Ohio

**Figure FSAP-2  
PROPOSED EXCAVATION AND COORDINATE GRID SYSTEM SAMPLING AREAS**





**ATTACHMENT FSAP-1**

**XRF Standard Operating Procedure**

**X-RAY FLUORESCENCE (XRF) ANALYSIS OF SOIL  
STANDARD OPERATING PROCEDURES**

**FOR**

**THE MASTER METALS, INC. SITE  
CLEVELAND, OHIO**

**PREPARED BY:  
ENTACT & Associates, LLC.**

**March, 2001**

## Table of Contents

I. Principle, Scope and Application .....	1
II. Parameters To Be Measured.....	1
III. Range Of Measurement .....	1
IV. Detection Limit.....	1
V. Sample Matrix.....	1
VI. Interferences and Corrective Actions.....	1
VII. Safety Precautions and Emergency Procedures.....	2
VIII. Sample Size, Collection, Preservation and Handling.....	4
IX. Apparatus and Materials .....	4
X. Routine Preventative Maintenance .....	4
XI. Calibration Standards.....	5
XII. Calibration Procedures .....	6
XIII. Sample Preparation .....	13
XIV. Analytical Measurement .....	13
XV. Data Treatment.....	15
XVI. Data Deliverables.....	15
XVII. Quality Control Requirements.....	16
XVIII. References .....	16

## I. Principle, Scope and Application

The purpose of this standard operating procedure (SOP) is to serve as a guide for the field analysis of soils for metals. The procedures herein are general operating procedures for the Spectrace 9000 XRF Analyzer or equivalent. They contain detailed procedures for calibration, operation and maintenance of the XRF.

X-radiation of sufficient energy will cause all atoms to fluoresce, emitting x-rays of characteristic energy. By analyzing the fluorescent radiation emitted by a sample under excitation, both the identity and the quantity of the elements present in the sample can be determined.

## II. Parameters To Be Measured

- A. Lead is the contaminant of concern at this site and will be the only metal measured and reported by the XRF.

## III. Range Of Measurement

- A. The range of measurements for lead is 50 ppm through 300,000 ppm.

## IV. Detection Limit

- A. The detection limit is variable with each analysis. The detection limit for each analysis is three times the XRF calculated standard deviation.

Example:

1. The XRF calculated standard deviation is 5 ppm.
2.  $5 \times 3 = 15$
3. The detection limit is 15 ppm.

## V. Sample Matrix

- A. The SOP is applicable to both in-situ and ex-situ soils and waste.

## VI. Interferences and Corrective Actions

- A. Lead - Arsenic Interference

### 1. Interference

Due to the close proximity of the spectra for lead and arsenic, arsenic levels may be masked when the arsenic levels are less than 10% that of lead.

### 2. Corrective Action

TN Technologies has developed an additional software package for the Spectrace 9000 that will allow the XRF to detect arsenic when levels are as low as 5% that of lead.

B. Moisture

1. Interference

High moisture content (approximately 20% moisture) of muds and sludges can cause erroneous results.

2. Corrective Action

Soils containing high moisture content should be dried prior to analysis.

C. Matrix Effects

1. Interference

Physical characteristics such as particle size and homogeneity can affect the accuracy of the analysis.

2. Corrective Action

Whenever a new matrix is encountered a sample should be analyzed by both XRF and the laboratory analysis to ensure the XRF accurately analyzes the constituents in the matrix.

D. Placement

1. Interference

If the XRF probe is not placed on a flat uniform soil location errors can result from the distance between the probe and the soil.

2. Corrective Action

Ensure with each measurement that the probe window is placed flat against a uniform flat surface.

VII. Safety Precautions and Emergency Procedures

The State of Ohio Department of Health, Bureau of Radiation Protection will be properly notified prior to bringing the XRF instrument to the site.

A. Radiation Levels

According to the Spectrace 9000 users manual, the radiation exposure rate due to the XRF sources with the shutters closed is <0.1 mR/h. In addition, while the shutters are open, the exposure rate remains low provided a sample is completely covering the probe window. The XRF should never be run without a sample over the probe window.

B. Shipment

Under U.S. DOT regulations (49 CFR, 173.422) and International Air Transport Association (IATA), the XRF unit is classified as "Radioactive material, excepted

package, instruments, UN2910.” As such, the device can be transported by any mode-air, land or sea. It is eligible to be transported in the baggage compartment of a passenger-carrying aircraft. The device is excepted from all specification packaging, marking and labeling. The bill of lading should, however, contain the words: “Radioactive material, excepted package, instruments, UN2910.”

#### C. Storage

ENTACT’s XRF units are licensed and permanently stored in the ENTACT Wood Dale office. The units can be transported to and temporarily (less than 30 days) stored in another state without the state being notified. If it is going to be transported to and stored in another state for longer than 30 days, that state must be contacted to determine the process involved with registering the XRF in that state.

#### D. Emergency Procedures

1. Secure the area around the incident. Keep unauthorized persons away. Alert people in vicinity of radioactive material and possible hazards.

2. DO NOT LEAVE THE SITE. Send a helper to notify the following persons:

Radiation Safety Officer (RSO): Pat Vojack  
Work Phone: (630) 616-2100 Cell Phone: (630) 842-9860  
Home Phone: (847) 698-7508  
and  
Local Fire and Police Departments 911

3. The Radiation Safety Officer will provide appropriate notification to:

Ohio Department of Health, Bureau of Radiation Protection: (614)644-2727  
and  
TN Technologies Inc.: (512) 388-9285 or (512) 388-9287

4. The RSO or alternate should inform emergency workers of the potential for existence of a radiation hazard; should help keep the area secure; and should explain to emergency personnel the location of the radioactive device and the extent of the possible hazard. In no case should the response personnel leave the site until qualified experts arrive, unless the worker is seriously injured or incapacitated, and must be removed from the site by emergency personnel.

If the RSO cannot be reached, notify Don Self.

Work Number: (972) 580-1323  
Home Number: (972) 475-2737

## VIII. Sample Size, Collection, Preservation and Handling

A. The sample size, collection and handling requirements for samples undergoing XRF analysis are determined on a site specific basis. These are to be addressed in the site work plan and quality control plan. The exact requirements will vary depending on the use of the XRF on the site. No preservation is required for soils that are to be analyzed for metals.

## IX. Apparatus and Materials

### A. Probe

The probe consists of a sealed aluminum enclosure containing a high resolution mercuric iodide detector and three radioisotope x-ray excitation sources. The probe aperture window, through which the analysis is performed, is sealed with thin replaceable film. The probe also contains a pre-amplifier and bias supply for the detector and a mechanism to move the radioisotope sources from their shielded location during an analysis.

### B. Electronics Unit

The electronics unit provides data acquisition, processing, and display capabilities. The computer includes a math coprocessor for fast calculation of results. Sufficient memory is available to store up to 300 sets of analysis and 120 spectra. An RS-232 port allows stored data to be transferred to another computer. The graphics display allows direct viewing and qualitative analysis of the x-ray spectra. The replaceable and rechargeable internal battery provides for field portable operation.

### C. Additional Parts and Accessories

Additional parts and accessories include: the interconnecting cable, battery chargers, RS-232C interface cable, carrying case, carrying bag, spare battery, analysis stand, Teflon bank and metal standards.

## X. Routine Preventative Maintenance

-ENTACT identifies each XRF result with a unique identification number which all routine preventative maintenance to be accomplished as follows:

### A. Standardization

The XRF must be standardized by technicians at TN Technologies on an annual basis.

### B. Leak Tests

The XRF must be leak tested by technicians at TN Technologies every six months.

### C. Source Change

The sources on the XRF must be changed by technicians at TN Technologies according to the following schedule:

Cd-109	2.5 years
Fe-55	5 years
Am 241	never

D. Film change

The film covering the aperture window needs to be changed whenever it is Damaged (i.e., punctured, ripped, smeared).

XI. Calibration Standards

A. Site Specific Standards

1. Preparation

- a. Collect three soil samples from the site in which XRF analysis will be performed. Use the XRF to guide the collection process. Attempt to collect samples that vary over the range of total lead levels detected at the site during the EECA (refer to Figure 1-3 of RD/RA Workplan).
- b. Transport the samples to the lab and instruct the analyst to perform the following in the order listed for each sample:
  - Dry the samples
  - Grind the samples into a fine powder, removing any rocks or debris
  - Homogenize each individual sample
  - Split each sample. Return one half to ENTACT for use as the standard. Analyze the other half five times for total lead. The lab should then average the results giving a "certified value".
- c. Prepare the site-specific standards using the returned portions of the samples. Place the soil into the XRF sample cups, cover with film and seal. The total lead value of the standard is the average of the five laboratory total lead values.
- d. Use three of the prepared standards to check the standard daily for a calibration check

2. Storage

- a. The standards must be stored in a manner that will prevent damage to the film.
- b. The shelf life of the site-specific standards is 6 months. Upon expiration of these standards, the standard value should be re-certified by submitting additional sample to the laboratory for re-



analysis.

B. Teflon

1. Storage

- a. The Teflon standard must be stored in a manner that will prevent damage and contamination.
- b. These standards have an unlimited shelf life.

C. Pure Metal Standards

1. Storage

- a. The five pure metal standards (lead, iron, tin, titanium and zinc) standards must be stored in a manner that will prevent damage and contamination.
- b. These standards have an unlimited shelf life.

XII. Calibration Procedures

-The following procedures should be performed at the beginning of each days analysis. In addition one site-specific standard to be analyzed for every twenty sample locations analyzed. Finally, at the end of the day all three site-specific standards should be re-analyzed.

A. Instrument Set-up

1. Place the electronics portion of the XRF on a flat surface, adjusting the handle to be used as a stand.
2. Connect the Electronics portion to the probe using the interconnecting cable.
  - a. When inserting the cable into the probe and electronics portion, pull back metal cover on end of the cable, align the red dot on the cable with the groove on the insertion point and finally gently insert the cable until you hear a soft "click".
3. Remove the safety cover from the probe.
4. Place the probe on the lab stand base.
5. Secure the shield cup to the top of the probe.

B. Turn on procedures

1. Turn on the unit.

- a. Press the "On" button.
- b. You will then receive the prompt, "Is 0:00:00 the correct time?". If it is the correct time, press "yes" (the number 1 button). If it is not the correct date, press "no" (the number 2 button). The XRF will then instruct you on how to reset the time.
- c. You will then receive the prompt, "Is 0:00:00 the correct date?". If it is the correct date, press "yes" (the number 1 button). If it is not the correct date, press "no" (the number 2 button). The XRF will then instruct you on how to reset the date.
- d. Allow the XRF to warm-up for at least 10 minutes.

#### C. Calibration

1. You are now at the main menu. Select measure (press the number 1 button).
2. You now need to modify the scanning time to allow 50 seconds per source to scan the iron standard.
  - a. Select "modify" (press the number 1 button).
  - b. Select the "Mod" (press the number 3 button).
  - c. Enter 50 and press the Cont/Pause button.
  - d. Select "Down" (press the number 2 button).
  - e. Select "Mod" (press the number 3 button).
  - f. Enter 50 and press the Cont/Pause button).
  - g. Select "Down" (press the number 2 button).
  - h. Select "Mod" (press the number 3 button).
  - i. Enter 50 and press the Cont/Pause button.
  - j. Select "Exit" (press the number 6 button).
3. You are now ready to analyze the iron (FE) standard.
  - a. Place the iron standard over the source window.
  - b. Close the shield cup lid.

- c. Press the Cont/Pause button.
  - d. You will now see the label screen.
  - e. Select the column with "F" in it (press the number 2 button).
  - f. Select "F" (press the number 6 button).
  - g. Select the column with "E" in it (press the number 2 button).
  - h. Select "E" (press the number 5 button).
  - i. Press the Cont/Pause button.
  - j. Select "Opts" (press the number 5 button).
  - k. Select "See raw data" (press the number 5 button).
  - l. Select "Cd109 33" (press the number 1 button).
  - m. Select "Intensities" (press the number 6 button).
  - n. Select "Down" (press the number 2 button) until you can read the value for iron (FE). This value should be between 0.98 and 1.02. If it is not, perform an energy calibration. The procedures for an energy calibration are discussed in Section D of this section.
  - o. Select "Quit" (press the number 6 button).
  - p. Select "Quit" (press the number 7 button).
  - q. Select "EXIT" (press the number 0 button).
4. You now need to modify the scanning time for all three sources to measure the Teflon standard.
- a. Select "Measure" (press the number 1 button).
  - b. Select "modify" (press the number 1 button).
  - c. Select "Mod" (press the number 3 button).
  - d. Enter 200 and press the Cont/Pause button.
  - e. Select "Down" (press the number 2 button).
  - f. Select "Mod" (press the number 3 button).

- g. Enter 200 and press the Cont/Pause button.
  - h. Select "Down" (press the number 2 button).
  - i. Select "Mod" (press the number 3 button).
  - j. Enter 200 and press the Cont/Pause button.
  - k. Select "Exit" (press the number 6 button).
5. You are now ready to analyze the Teflon standard.
- a. Place the Teflon standard over the source window.
  - b. Close the shield cup lid.
  - c. Press the Cont/Pause button.
  - d. You will now see the label screen.
  - e. Select the column with "T" in it (press the number 5 button).
  - f. Select "T" (press the number 6 button).
  - g. Select the column with "E" in it (press the number 2 button).
  - h. Select "E" (press the number 5 button).
  - i. Select the column with "F" in it (press the number 2 button).
  - j. Select "F" (press the number 6 button).
  - k. Select the column with "L" in it (press the number 3 button).
  - l. Select "L" (press the number 6 button).
  - m. Select the column with "O" in it (press the number 4 button).
  - n. Select "O" (press the number 3 button).
  - o. Select the column with "N" in it (press the number 4 button).
  - p. Select "N" (press the number 2 button).
  - q. Press the Cont/Pause button.

- r. Press the zero button.
  - s. Select "Page down" (press the number 2 button).
  - t. For all results, the result divided by the standard deviation should be less than five (5). If it is not, acquire new background data are discussed in Section E of this section.
6. You now need to modify the scanning times for site specific calibration.
- a. Select "modify" (press the number 1 button).
  - b. Select "Mod" (press the number 3 button).
  - c. Enter 40 and press the Cont/Pause button.
  - d. Select "Down" (press the number 2 button).
  - e. Select "Mod" (press the number 3 button).
  - f. Enter 10 and press the Cont/Pause button.
  - g. Select "Down" (press the number 2 button).
  - h. Select "Mod" (press the number 3 button).
  - i. Enter 10 and press the Cont/Pause button.
  - j. Select "Exit" (press the number 6 button).
7. You are now ready to analyze the site specific standards.
- a. Place one of the site specific standards over the source window.
  - b. Close the shield cup lid.
  - c. Press the Cont/Pause button.
  - d. You will now see the label screen.
  - e. Select the column with the first letter or number of your standard name (press the appropriate number button).
  - f. Continue this process for the entire standard label.

- g. Press the Cont/Pause button.
- h. Press the zero button.
- i. Select "Page down" (press the number 2 button).
- j. Note the value for lead (Pb) or whatever element for which you are analyzing the samples.
- k. Repeat steps c-j for the standard two more times. Each standard should be analyzed in triplicate.
- l. The average of the three values found for the standard should be within  $\pm 20\%$  of the known value of the standard. If it is now, perform an energy calibration. The procedures for an energy calibration are discussed in Section D of this section.
- m. Repeat steps a-l for all other site specific standards.

*The XRF is now ready to be used.*

#### D. Energy Calibration

- 1. You are now at the Main menu. Select measure (press the number 1 button).
- 2. Select "Options" (press the number 5 button).
- 3. Select "Energy calibration" (press the number 1 button).
- 4. The XRF will then say "Measure Safety Cover".
- 5. Put the safety cover on the probe.
- 6. Select "Proceed" (press the number 1 button).
- 7. The XRF will return to the analysis screen when the energy calibration is complete.

#### E. Background Data Acquisition

- 1. You are now at the Main menu. Select measure (press the number 1 button).
- 2. Select "Options" (press the number 5 button).
- 3. Select "Acquire background data" (press the number 2 button).
- 4. The XRF will then say "Measure Quartz".

5. Put the quartz standard on the probe.
6. Select "Proceed" (press the number 1 button).
7. The XRF will return to the analysis screen complete and give further instructions. Follow these instructions until acquisition is complete.

### XIII. Sample Preparation

#### A. In-situ Samples

1. Clear the soil of all vegetation.
2. Clear the soil of any debris that may puncture the aperture window.
3. Tamp the soil to ensure it is flat and free of voids.

#### B. Collected Samples

1. Dry the samples in an oven or microwave oven.
2. Grind the samples into a fine powder, removing any large rocks or debris.
3. Homogenize the sample to ensure consistency.
4. Place the soil into an XRF soil cup, cover with film and seal.

### XIV. Analytical Measurement

#### A. Instrument Set-up

handle

1. Place the electronics portion of the XRF on a flat surface, adjusting the handle to be used as a stand.
2. Connect the Electronics portion to the probe using the interconnecting cable.
  - a. When inserting the cable into the probe and electronics portion, pull back metal cover on end of the cable, align the red dot on the cable with the groove on the insertion point and finally gently insert the cable until you hear a soft "click".
3. Remove the safety cover from the probe.

#### B. Turn on procedures.

1. Turn on the unit.
  - a. Press the "On" button.
  - b. You will then receive the prompt, "Is 0:00:00 the correct time?". If it is the correct time, press "yes" ( the number 1 button). If it is now the correct time, press "no" ( the number 2 button). The XRF will then instruct you on how to reset the time.
  - c. You will then receive the prompt, "Is 0:00:00 the correct date?". If it

is the correct date, press “yes” (the number 1 button). If it is not the correct date, press “no” (the number 2 button). The XRF will then instruct you on how to reset the date.

d. Allow the XRF to warm-up for at least 10 minutes.

### C. Field use

1. You are now at the main menu. Select measure (press the number 1 button).
2. You now may need to modify the scanning time.
  - a. Select “modify” (press the number 1 button).
  - b. Select “Mod” (press the number 3 button).
  - c. Enter 40 and press the Cont/Pause button.
  - d. Select “Down” (press the number 2 button).
  - e. Select “Mod” (press the number 3 button).
  - f. Enter 10 and press the Cont/Pause button.
  - g. Select “Down” (press the number 2 button).
  - h. Select “Mod” (press the number 3 button).
  - i. Enter 10 and press the Cont/Pause button.
  - j. Select “Exit” (press the number 6 button).
3. You are now ready for analysis.
  - a. Place one of the sample over the source window or place the probe on the area to be analyzed making sure the window is not punctured.
  - b. Close the shield cup lid if applicable.
  - c. Press the Cont/Pause button.
  - d. You will now see the label screen.
  - e. Select the column with the first letter or number of your sample name (press the appropriate number button).
  - f. Continue this process for the entire sample label.



- g. Press the Cont/Pause button.
- h. Press the zero button.
- i. Select "Page down" (press the number 2 button).
- j. Note the value for lead (Pb) or whatever element for which you are analyzing the samples.
- k. Repeat steps c-j for the sample two more times. Each sample should be analyzed in triplicate.

#### XV. Data Treatment

- A. The result at each sample location is recorded
- B. All readings must be greater than three times the XRF calculated standard deviation in order to be considered valid.

$$\text{Reading} > 3 * \text{Standard deviation}$$

If the above level is not achieved increase the scan time until it is achieved.

#### XVI. Data Deliverables

-The following documents are available to the client upon request:

- A. A summary of initial, ongoing and end of analysis calibration results. This should include each reading, the average of the three readings for each sit-specific standard and the percent difference between the result and the laboratory determined value.
- B. A logbook detailing the following:
  - 1. Weather conditions
  - 2. Sampler/s
  - 3. Date of analysis
  - 4. Time of each analysis
  - 5. Location of each analysis
  - 6. Sample preparations required
  - 7. Results of each analysis
  - 8. Any problems encountered and corrective actions taken
  - 9. List date of XRF purchase, latest calibration, leak test and source replacement
- C. A printout of all results saved on the XRF and downloaded to a PC. This will be downloaded and formatted in EXCEL and will include sample number, date taken and value in ppm.

D. A summary of all QC required. This will be determined on a site specific basis.

**XVII. Quality Control Requirements**

A. The quality control requirements for the use of the XRF are determined on a site specific basis. These are to be addressed in the site work plan and quality control plan. The exact requirements will vary depending on the use of the XRF on the site. However, all plans should require instrument calibration prior to and after XRF usage.

**XVIII. References**

A. Spectrace 9000 Analyzer Manual  
TN Technologies Inc.  
1992, 1993 and 1994

B. Quality Assurance Technical Information Bulletin  
US Environmental Protection Agency  
Vol. 1, No. 4  
May 1991



**ATTACHMENT FSAP-2**

**TSP Standard Operating Procedure**

**TOTAL SUSPENDED PARTICULATE  
AIR SAMPLING  
STANDARD OPERATING PROCEDURES  
  
FOR  
  
THE MASTER METALS, INC. SITE  
CLEVELAND, OHIO**

**PREPARED BY:  
ENTACT & Associates, LLC.**

**March 2002**

TSP Air Sampling for Lead  
Standard Operating Procedures  
Table of Contents

1. Principle, Scope and Application
2. Parameters To Be Measured
3. Range of Measurement
4. Detection Limit
5. Sample Matrix
6. Sample Media
7. Interference and Corrective Actions
8. Safety Precautions and Emergency Procedures
9. Apparatus and Materials
10. Routine Preventative Maintenance
11. Calibration System
12. Calibration Procedures
13. Sample Collection
14. Calculations
15. Analytical Measurement
16. Quality Control Requirements
17. Reference

## I. Principle, Scope and Application

The purpose of this standard operating procedure (SOP) is to serve as a guide for the field collection and handling TSP high volume samples. The procedures herein are general operating procedures for the Graseby Mass Flow Controlled Total Particulate Sampling System or equivalent. They contain detailed procedures for calibration, operation and maintenance of these pumps.

Sample collection involves the use of a high volume vacuum pump to pull air through a filter, depositing airborne agents on the filter. The filter is then analyzed in an accredited laboratory to determine how much of the agent of interest was deposited on the filter. Then, using the volume of air collected, the airborne concentration of the contaminate can be determined.

## II. Parameters To Be Measured

### A. Airborne lead.

## III. Range Of Measurement

### A. Airborne lead.

#### 1. 0.07 micrograms per cubic meter of air

\* assuming 2,400 cubic meters of air collected

## IV. Detection Limit

### A. Airborne lead.

#### 1. 0.07 micrograms per cubic meter of air

\* assuming 2,400 cubic meters of air collected

## V. Sample Matrix

### A. This SOP is applicable to airborne contaminants.

## VI. Sample Media

### A. Glass filter.

## VII. Interferences and Corrective Actions

### A. Light scattering

High concentrations of dissolved solids can produce scattering during atomic absorption analysis. This can be corrected instrumentally.

B. The combination of sample collection and analysis standard deviations is on average seven (7) to nine (9) percent.

## VIII. Safety Precautions and Emergency Procedures

### A. Explosion

1. Do not operate the pump or change its battery pack in oxygen enriched atmospheres or in atmospheres containing combustible gases, vapors or other explosive materials. An explosion may occur.

## IX. Apparatus and Materials

### A. Pump assembly.

1. Lid assembly.
2. Blower / Motor.
3. Mass Flow Controller.
4. Timer.
5. Flow Recorder.
6. Filter Paper Cartridge.

### B. Calibration System

1. Vari-Flo Orifice Unit.
2. Calibration air hose.
3. Top Loading Adapter.
4. Digital Manometer.
5. Carrying Case.

## X. Routine Preventative Maintenance

### 1. Routine Inspections

- Power cords
- Filter Screen
- Frame Gasket
- Recorder Pen
- Motor Tubing
- Motor Flange Gasket and Cushion

### 2. Motor Brushes

- Motor Brushes should be changed every 400-500 hours in operation.

### 3. Calibration System Calibration

- The calibration system should be calibrated by the manufacturer on an annual basis.



## XI. Calibration System

A. The Graseby Vari-Flo Gilibrator Calibration System is to be used for calibration operations.

## XII. Calibration Procedures

### A. Frequency

Samplers should be calibrated per manufacturers recommendations or as indicated in the workplan, quality control plan, order or permit.

### B. Procedures

1. Assemble calibration equipment.
2. Install the vari-flow orifice.
3. Perform a leak check.
4. Record the date, time temperature, barometric, pressure, sampler unit number, person performing calibration and the serial number of the calibration orifice.
5. Turn on the unit and allow to warm up.
6. Adjust the orifice so that the manometer is reading approximately 1.0 inches of water.
7. Record the exact manometer reading as well as recorder chart reading.
8. Repeat step 6 & 7 for 2, 3, 4 and 5 inches of water.
9. Turn off the unit.
10. Using the computer air monitoring calibration calculation software, calculate the orifice flow rate (Qa), corrected recorder response (IC), the set flow rate (SFR) and set point recorder response (SSP).
11. Turn on sampler unit, allow to warm up and set to the SSP.

## XIII. Sample Collection

### A. Frequency

Samples are to be collected on a twenty-four (24) hour cycle as per the workplan, order or permit requirements.

B. Procedures

1. Remove the filter from its envelope. On the envelope, record the date and the sampling unit where the filter will be used.
2. Position the new filter in the appropriate filter paper cartridge.
3. Go to the appropriate air monitoring station.
4. Turn off the unit.
5. Record the time that the unit was turned off on the used recorder chart.
6. Remove and cover the used filter paper cartridge.
7. Position the new filter paper cartridge and secure to the unit.
8. Close the collection unit hood.
9. On a new recorder chart, record the current date, time and sampler unit number.
10. Turn on the unit.
11. Check to see that the unit is operating at the correct recorder response point.
12. Close the unit door.
13. Return the filter paper cartridge and recorder chart to the site office / lab facilities.
14. Remove the filter from the filter paper cartridge.
15. Fold the filter in half, in on itself and place back into its original envelope.
16. Seal the envelope.
17. Using the collection time and sampler air flow rate, calculate the total volume of air collected.

18. Fill out the daily air monitoring log using the calculation equations presented in Section XIV
19. As necessary, fill out chain-of-custody forms, label the filter envelopes and deliver the filter to the laboratory for analysis.
20. Save all unanalyzed filters and recorder charts for six (6) month or as otherwise noted in the workplan, order or permit.
21. Clean and properly store the filter paper cartridge for future use.

#### XIV. Calculations

##### A. Volume of air.

1. Flow rate (FR) is to be determined by looking up the average daily recorder chart reading on the calibration correlation table, generated by the computer air monitoring calibration calculation software, and reading the corresponding flow rate.
2. Use the flow rate and collection time in minutes to calculate the volume collected.

$$\text{Volume} = \text{FR} \times \text{time}$$

$$\begin{aligned}\text{ex. Volume} &= 2.0 \text{ L/min.} \times 640 \text{ min.} \\ &= 1280 \text{ L of air collected}\end{aligned}$$

#### XV. Analytical Measurement

- The analytical method cited in either the work plan or quality control plan should be used to analyzed the air samples. The method should be consistent with 40 CFR Part 50 Appendix G.

#### XVI. Quality Control Requirements

- A. The quality control requirements for the use of the TSP units are determined on a site specific basis. These are to be addressed in the site work plan, quality control plan and the site health and safety plan. The exact requirements will be dependant on specific site and/or order requirements. However all plans should include the periodic analysis of filter lot blanks.

#### XVII. References

##### A. 40 CFR Part 50

##### B. Operations Manual for The Graseby Model GS2310 TSP Sampling System Mass Flow Controlled

---

C. Instruction and Operation Manual - High Volume PM10 Sampler



**ATTACHMENT FSAP-3**

**Area/Personal Low-Volume Air Sampler  
Standard Operating Procedure**

**PERSONAL & AREA LOW VOLUME AIR SAMPLING  
FOR LEAD  
STANDARD OPERATING PROCEDURES**

**FOR**

**THE MASTER METALS, INC. SITE  
CLEVELAND, OHIO**

**PREPARED BY:  
ENTACT & Associates, Inc.**

**March, 2002**

Personal & Area Low Volume Air Sampling for Lead  
Standard Operating Procedures  
Table of Contents

I. Principle, Scope and Application .....	1
II. Parameters To Be Measured.....	1
III. Range of Measurement .....	1
IV. Detection Limit.....	1
V. Sample Matrix.....	1
VI. Interferences and Corrective Actions.....	2
VII. Safety Precautions and Emergency Procedures.....	2
VIII. Apparatus and Materials .....	2
IX. Routine Preventative Maintenance .....	2
X. Calibration System.....	3
XI. Calibration Procedures.....	3
XII. Sample Collection .....	3
XIII. Calculations.....	5
XIV. Analytical Measurement.....	5
XV. Quality Control Requirements .....	5
XVI. References.....	6



## Personal & Area Low Volume Air Sampling for Lead Standard Operating Procedures

### I. Principle, Scope and Application

The purpose of this standard operating procedure (SOP) is to serve as a guide for the field collection and handling of personal / area air samples. The procedures herein are general operating procedures for MSA Escort pumps or equivalent. They contain detailed procedures for calibration, operation and maintenance of these pumps.

Sample collection involves the use of a low volume vacuum pump to pull air through a filter cassette, depositing airborne agents on the filter. The filter is then analyzed in an accredited laboratory to determine how much of the agent of interest was deposited on the filter. Then, using the volume of air collected, the airborne concentration of the contaminate can be determined.

### II. Parameters To Be Measured

A. Airborne lead.

### III. Range of Measurement

A. NIOSH Method 7082

0.05 mg/m<sup>3</sup> to > 1 mg/m<sup>3</sup> for a 200 L air sample.

B. NIOSH Method 7105

0.002 mg/m<sup>3</sup> for a 200 L air sample.

C. NIOSH Method 7300

0.005 mg/m<sup>3</sup> for a 500 L air sample.

### IV. Detection Limit

A. NIOSH Method 7082

0.05 mg/m<sup>3</sup> for a 200 L air sample.

B. NIOSH Method 7105

0.002 mg/m<sup>3</sup> for a 200 L air sample.

C. NIOSH Method 7300

0.005 mg/m<sup>3</sup> for a 500 L air sample.

## V. Sample Matrix

- A. This SOP is applicable to airborne contaminants.

## VI. Interferences and Corrective Actions

- A. Avoid operating during periods of heavy rain or in areas in which water is being sprayed or misted. Filter damage may occur.
- B. High concentrations of calcium, sulfate, carbonate, phosphate, iodide, fluoride or acetate can cause interferences during laboratory analysis. These can be offset by an additional sample treatment step.
- C. Do not exceed a filter loading of 2 mg of total dust.

## VII. Safety Precautions and Emergency Procedures

- A. Explosion
  - 1. Do not operate the pump or change its battery pack in oxygen enriched atmospheres or in atmospheres containing combustible gases, vapors or other explosive materials. An explosion may occur.

## VIII. Apparatus and Materials

- A. Pump assembly.
  - 1. Pump.
  - 2. Pump air hose.
  - 3. Filter cassette.
  - 4. Battery pack.
- B. Calibration System
  - 1. Calibration unit.
  - 2. Calibration air hose.
  - 3. Calibration fluid.

## IX. Routine Preventative Maintenance

- 1. Battery Charge
  - The battery should be charged following each days use to ensure proper operation.

2. Inlet filter check and replacement

- The internal inlet filter should be checked periodically for particles and water and should be changed when clogged.

3. Calibration System Calibration

- The calibration system should be calibrated by the manufacturer on an annual basis.

X. Calibration System

- A. A Gilian Gilibrator Calibration System is to be used for calibration operations.

XI. Calibration Procedures

- The following procedures should be performed prior to and after each use of a personal / area pump.

A. Turn on the pump and calibration system. Allow the pump to operate in the environment to be sampled, with a filter cassette positioned as if actual sample was being collected for approximately 2 - 5 minutes prior to calibration.

B. Connect a filter cassette to the pump air hose. Connect the opposite cassette inlet to the calibration system.

C. Take five readings at the flow rate to be used during sampling with the calibration system. The average of the five is the initial flow rate.

D. At the end of the day's operations, after the sample has been collected, repeat steps A - C. This will give the final flow rate. The flow rate is the average of the initial flow rate and the final flow rate.

XII. Sample Collection

A. Frequency

- Unless otherwise specified, personal air samples should be collected at the following frequency.

1. According to 29 CFR 1926.62, initial exposure determination should be made whenever there has been a change of equipment, process, control, personnel or a new task has been initiated that may result in additional employees being exposed

to lead at or above the action level of  $30 \mu\text{g}/\text{m}^3$  or the permissible exposure limit (PEL) of  $50 \mu\text{g}/\text{m}^3$ , and as follows:

- a. If the initial determination shows levels to be below of  $30 \mu\text{g}/\text{m}^3$ , no further monitoring need be performed except as noted in XII (A) (1).
- b. If the initial determination shows levels to be above  $30 \mu\text{g}/\text{m}^3$  but below of  $50 \mu\text{g}/\text{m}^3$ , monitoring needs to be performed every 6 months or until two consecutive measurements, taken at least 7 days apart, show levels to be below  $30 \mu\text{g}/\text{m}^3$  at which time monitoring may be discontinued until there is a change in conditions as noted in XII (A) (I).
- c. If the initial determination shows levels to be above  $50 \mu\text{g}/\text{m}^3$ , monitoring needs to be performed quarterly or until two consecutive measurements, taken at least 7 days apart, show levels to be below  $50 \mu\text{g}/\text{m}^3$ , at which time monitoring may be performed every 6 months. If two consecutive measurements, taken at least 7 days apart, show levels to be below  $30 \mu\text{g}/\text{m}^3$ , monitoring may be discontinued until there is a change in conditions as noted in XII (A) (I).

#### B. Procedures

1. Following initial calibration, connect a new filter cassette to the pump air hose.
2. Secure the pump onto the person being monitored, positioning the filter cassette inlet within the persons breathing zone (between the chest and nose).
3. Remove the end-cap from the filter cassette.
4. Turn on the pump.
5. Document the time that the pump was turned on, the person being monitored and the task he/she is performing.
6. Allow the pump to operate throughout the day's activities.
7. The pump is to be checked periodically during sample collection by the person performing the sampling, to ensure the pump is operating properly. At the end of

the day's activities, turn off the pump.

8. Replace the end-cap on the filter cassette.
9. Document the time that the pump was turned off.
10. Remove the filter from the pump air hose and replace the other end-cap on the filter cassette.
11. Label the cassette.
12. Calibrate the air pump.
13. Fill out all appropriate chains of custody and other required forms, and Prepare the cassette(s) for shipment to the laboratory.

### XIII. Calculations

#### A. Volume of air.

1. Calculate the flow rate (FR) in mL/min. of air.  
$$FR = (\text{initial flow rate} + \text{final flow rate}) / 2$$

ex.  $FR = (1500 \text{ mL/min.} + 2500 \text{ mL/min.}) / 2$   
 $= 2000 \text{ mL/min.}$
2. Convert flow rate into L/min.  
$$\text{Flow rate (FR) in L/min.} = FR \text{ in mL/min.} / 1000$$

ex.  $FR \text{ in L/min.} = 2000 \text{ mL/min.} / 1000$   
 $= 2.0 \text{ L/min.}$
3. Use the flow rate and collection time in minutes to calculate the volume collected.  
$$\text{Volume} = FR \times \text{time}$$

ex.  $\text{Volume} = 2.0 \text{ L/min.} \times 640 \text{ min.}$   
 $= 1280 \text{ L of air collected}$

### XIV. Analytical Measurement

- The analytical method cited in either the work plan or quality control plan should be

used to analyze the air samples. If no method is sited, one of the below methods should be used depending on the volume of air collected.

A. NIOSH Method 7082

1. 200 L - 1500 L of air for time weighted average (TWA) measurements.

B. NIOSH Method 7105

1. 1 L - 1500 L of air for TWA measurements.

C. NIOSH Method 7300

1. 50 L - 2000 L of air for TWA measurements.

XV. Quality Control Requirements

A. The quality control requirements for the use of the personal / area pumps are determined on a site specific basis. These are to be addressed in the site work plan, quality control plan and the site health and safety plan. The exact requirements will vary depending on the use of the personal / area pumps on the site. However, all plans should require instrument calibration prior to and after personal / area pump usage.

XVI. References

A. 29 CFR 1926.62

B. NIOSH Manual of Analytical Methods  
Fourth Addition  
August 15, 1994

C. MSA Escort Pump Users Manual

**APPENDIX D**

**FINAL QUALITY ASSURANCE PROJECT PLAN**

Master Metals Inc, Site  
Final ROD/RA Quality Assurance Project Plan  
Revision: 0  
March 2002

**QUALITY ASSURANCE PROJECT PLAN  
FOR THE  
MASTER METALS, INC. REMOVAL ACTION  
Cleveland, Cuyahoga County, Ohio**

**March 2002**

**Prepared by:**

**ENTACT & Associates, LLC.  
1360 N. Wood Dale Rd.  
Wood Dale, Illinois 60191**

  
\_\_\_\_\_  
Michael Stoub, ENTACT Project Coordinator

4-9-02  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Pat Vojack, P.G., ENTACT Quality Assurance Manager

4-9-02  
\_\_\_\_\_  
Date

  
\_\_\_\_\_  
Terry Harper, GeoAnalytical Laboratory QA Manager

4/11/02  
\_\_\_\_\_  
Date

\_\_\_\_\_  
Tim Harrison, Pace Analytical Laboratory QA Manager

\_\_\_\_\_  
Date

\_\_\_\_\_  
Gwenn Massenburg, USEPA Remedial Project Manager

\_\_\_\_\_  
Date

\_\_\_\_\_  
Richard Byvik, USEPA Superfund Quality Assurance Reviewer

\_\_\_\_\_  
Date



**QUALITY ASSURANCE PROJECT PLAN  
FOR THE  
MASTER METALS, INC. REMOVAL ACTION  
Cleveland, Cuyahoga County, Ohio**

**March 2002**

**Prepared by:**

**ENTACT & Associates, LLC.  
1360 N. Wood Dale Rd.  
Wood Dale, Illinois 60191**

*Michael Strouk*  
Michael Strouk, ENTACT Project Coordinator

4-9-02  
Date

*Pat Vojack*  
Pat Vojack, P.G., ENTACT Quality Assurance Manager

4-9-02  
Date

Terry Harper, GeoAnalytical Laboratory QA Manager

Date

*Tim Harrison*  
Tim Harrison, Pace Analytical Laboratory QA Manager

4-10-02  
Date

Gwenn Massenburg, USEPA Remedial Project Manager

Date

Richard Byvik, USEPA Superfund Quality Assurance Reviewer

Date

**Quality Assurance Project Plan, Revision 0  
Removal Design / Removal Action for the  
Master Metals, Inc. Site  
Cleveland, Ohio**

**TABLE OF CONTENTS**

<u>Section</u>	<u>Section-Page</u>
<b>1.0 PROJECT DESCRIPTION .....</b>	<b>1-1</b>
1.1 INTRODUCTION .....	1-1
1.2 SITE DESCRIPTION .....	1-1
1.2.1 Location .....	1-1
1.2.2 Local Geology, Hydrology and Hydrogeology.....	1-2
1.3 SITE/FACILITY HISTORY .....	1-2
1.3.1 General History .....	1-2
1.3.2 Past Regulatory and Data Collection Activities.....	1-3
1.3.2.1 Compliance Technologies, December 1990 .....	1-3
1.3.2.2 Ecology & Environment, July 1992.....	1-3
1.3.2.3 Phase I Time Critical Removal .....	1-4
1.3.2.4 Phase II Engineering Evaluation and Cost Assessment....	1-4
1.3.3 Current Status.....	1-5
1.4 PROJECT OBJECTIVES AND INTENDED DATA USAGE .....	1-6
1.4.1 Project Target Parameters .....	1-7
1.4.1.1 Excavation of Lead-Impacted Soils .....	1-7
1.4.1.2 Stabilization of Lead-Impacted Soils.....	1-8
1.4.1.3 Backfilling.....	1-8
1.4.1.4 Air Monitoring .....	1-8
1.4.1.5 Waste Characterization .....	1-8
1.4.1.6 Wastewater Characterization .....	1-9
1.4.2 Field Parameters.....	1-9
1.4.3 Laboratory Parameters .....	1-9
1.5 SAMPLE NETWORK DESIGN AND RATIONALE.....	1-9
1.6 PROJECT SCHEDULE.....	1-10
<b>2.0 PROJECT ORGANIZATION AND RESPONSIBILITY .....</b>	<b>2-1</b>
2.1 PROJECT ORGANIZATION CHART.....	2-1
2.2 MANAGEMENT RESPONSIBILITIES.....	2-1
2.3 QUALITY ASSURANCE RESPONSIBILITIES.....	2-3
2.4 LABORATORY RESPONSIBILITIES .....	2-4
<b>3.0 QUALITY ASSURANCE (QA) OBJECTIVES FOR MEASUREMENT DATA .....</b>	<b>3-1</b>
3.1 PRECISION .....	3-1
3.1.1 Definition .....	3-1
3.1.2 Field Precision Objectives .....	3-1

**Quality Assurance Project Plan, Revision 0  
Removal Design / Removal Action for the  
Master Metals, Inc. Site  
Cleveland, Ohio**

**TABLE OF CONTENTS**

<b><u>Section</u></b>	<b><u>Section-Page</u></b>
3.1.3 Laboratory Precision Objectives.....	3-1
3.2 ACCURACY .....	3-1
3.2.1 Definition .....	3-2
3.2.2 Field Accuracy Objectives .....	3-2
3.2.3 Laboratory Accuracy Objectives .....	3-2
3.3 COMPLETENESS.....	3-2
3.3.1 Definition .....	3-2
3.3.2 Field Completeness Objectives.....	3-2
3.3.3 Laboratory Completeness Objectives .....	3-2
3.4 REPRESENTATIVENESS .....	3-3
3.4.1 Definition .....	3-3
3.4.2 Measures to Ensure Representativeness of Field Data .....	3-3
3.4.3 Measures to Ensure Representativeness of Laboratory Data .....	3-3
3.5 COMPARABILITY.....	3-3
3.5.1 Definition .....	3-4
3.5.2 Measures to Ensure Comparability of Field Data.....	3-4
3.5.3 Measures to Ensure Comparability of Laboratory Data .....	3-4
3.6 LEVEL OF QUALITY CONTROL EFFORT .....	3-4
3.6.1 Field Data.....	3-4
3.6.2 Laboratory Data .....	3-4
 4.0 SAMPLING PROCEDURES .....	 4-1
4.1 SAMPLE DOCUMENTATION/IDENTIFICATION.....	4-1
4.2 SAMPLE COLLECTION/PREPARATION PROCEDURES .....	4-2
4.2.1 XRF Field Screening.....	4-2
4.2.2 Confirmatory Soil Samples.....	4-2
4.2.3 Backfill Material Sampling.....	4-3
4.2.4 Waste Characterization Sampling.....	4-3
4.2.5 Air Sampling.....	4-4
4.3 FIELD QC PROCEDURES.....	4-4
4.4 SAMPLE CONTAINERS, PRESERVATIVES AND VOLUMES.....	4-4
4.5 SAMPLE CUSTODY .....	4-5
4.6 DECONTAMINATION PROCEDURES .....	4-5
4.7 SAMPLE PACKAGING AND SHIPMENT PROCEDURES.....	4-6

**Quality Assurance Project Plan, Revision 0  
Removal Design / Removal Action for the  
Master Metals, Inc. Site  
Cleveland, Ohio**

**TABLE OF CONTENTS**

<b><u>Section</u></b>	<b><u>Section-Page</u></b>
<b>5.0 CUSTODY PROCEDURES .....</b>	<b>5-1</b>
5.1 FIELD CUSTODY PROCEDURES .....	5-1
5.1.1 Field Logbook Records.....	5-1
5.1.2 Sample Labels.....	5-1
5.1.3 Chain-of-Custody Records.....	5-2
5.2 LABORATORY CUSTODY PROCEDURES .....	5-2
5.3 FINAL EVIDENCE FILES .....	5-3
<b>6.0 CALIBRATION PROCEDURES AND FREQUENCY .....</b>	<b>6-1</b>
6.1 FIELD INSTRUMENT CALIBRATION .....	6-1
6.2 LABORATORY INSTRUMENT CALIBRATION .....	6-2
<b>7.0 ANALYTICAL AND MEASUREMENT PROCEDURES .....</b>	<b>7-1</b>
7.1 FIELD ANALYTICAL PROCEDURES .....	7-1
7.2 LABORATORY ANALYTICAL PROCEDURES .....	7-1
7.3 LIST OF TARGET COMPOUNDS AND REPORTING LIMITS.....	7-2
<b>8.0 INTERNAL QUALITY CONTROL (QC) CHECKS .....</b>	<b>8-1</b>
8.1 FIELD QUALITY CONTROL CHECKS.....	8-1
8.2 LABORATORY QUALITY CONTROL CHECKS.....	8-1
<b>9.0 DATA REDUCING, VALIDATION AND REPORTING.....</b>	<b>9-1</b>
9.1 DATA REDUCTION .....	9-1
9.1.1 Field Data Reduction Procedures.....	9-2
9.1.2 Laboratory Data Reduction Procedures .....	9-2
9.2 DATA VALIDATION.....	9-3
9.2.1 Procedures Used to Validate Field Data .....	9-3
9.2.2 Procedures Used to Validate Lab Data .....	9-3
9.3 DATA REPORTING .....	9-6
<b>10.0 PERFORMANCE AND SYSTEMS AUDITS.....</b>	<b>10-1</b>
10.1 INTERNAL AUDITS.....	10-1
10.2 EXTERNAL AUDITS.....	10-2
<b>11.0 PREVENTATIVE MAINTENANCE .....</b>	<b>11-1</b>

**Quality Assurance Project Plan, Revision 0  
Removal Design / Removal Action for the  
Master Metals, Inc. Site  
Cleveland, Ohio**

**TABLE OF CONTENTS**

<b><u>Section</u></b>	<b><u>Section-Page</u></b>
<b>12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY AND COMPLETENESS .....</b>	<b>12-1</b>
12.1 ACCURACY ASSESSMENT .....	12-1
12.2 PRECISION ASSESSMENT .....	12-2
12.3 COMPLETENESS ASSESSMENT .....	12-2
<b>13.0 CORRECTIVE ACTION .....</b>	<b>13-1</b>
13.1 FIELD CORRECTIVE ACTION .....	13-1
13.2 LABORATORY CORRECTIVE ACTION .....	13-2
13.3 CORRECTIVE ACTION DURING DATA VALIDATION AND DATA ASSESSMENT .....	13-2
13.4 IMMEDIATE CORRECTIVE ACTION .....	13-2
13.5 LONG-TERM CORRECTIVE ACTION .....	13-3
<b>14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT .....</b>	<b>14-1</b>
14.1 CONTENTS OF A PROJECT QA REPORT .....	14-1
14.2 QA REPORTING AND ROUTING SCHEDULE .....	14-1

**Quality Assurance Project Plan, Revision 0  
Removal Design / Removal Action for the  
Master Metals, Inc. Site  
Cleveland, Ohio**

**TABLE OF CONTENTS**

**List of Tables**

<b><u>Table</u></b>		<b><u>Follows Section</u></b>
Table QAPP-1	Intended Data Usage	1
Table QAPP-2	Summary Table of Grid Sampling and Analysis Program	3
Table QAPP-3	Metals Method 6010B, 7000 Series Soil Limits	7
Table QAPP-4	VOCs Method 8260 Soil Limits	7
Table QAPP-5	TPH Method 8440 (418.1) Soil Limits	7
Table QAPP-6	SVOC Method 8270 Soil Limits	7
Table QAPP-7	Pesticide/PCBs Method 8081 Soil Limits	7
Table QAPP-8	Field Instrument QC Criteria	8
Table QAPP-9	Maintenance Procedures for Field and Laboratory Equipment	11

**List of Attachments**

Attachment QAPP-A	Laboratory Standard Operating Procedures (retained in Wood Dale offices)
Attachment QAPP-B	GeoAnalytical Inc. QC Criteria
Attachment QAPP-C	Chain of Custody, Custody Seal and Label
Attachment QAPP-D	Laboratory Accreditations and Certifications

## LIST OF ACRONYMS/ABBREVIATIONS

ARARs	Applicable or Relevant and Appropriate Requirements
AOC	Area of Contamination
ASTM	American Standards for Testing Materials
BNA	Base-Neutral-Acid Extractables (Semivolatile Organics)
CCV	Continuing Calibration Verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
COC	Chain of Custody
CLP	Contract Laboratory Program
CRDL	Contract Required Detection Limits
CRQL	Contract Required Quantitation Limits
CRL	Central Regional Laboratory
DCF	Document Control Management
DQO	Data Quality Objective
EMSL	Environmental Monitoring and Support Laboratory
FSAP	Field Sampling and Analysis Plan
GMPP	Groundwater Monitoring Program Plan
ICP	Inductively Coupled Plasma
ICVS	Initial Calibration Verification Standard
MMI	Master Metals, Inc.
MS/MSD	Matrix Spike/ Matrix Spike Duplicate
µg/kg	Micrograms/kilograms
NIST	National Institute of Standard Technology
NPL	National Priorities List
NTU	Nephelometric Turbidity Units
OSC	On-Site Coordinator
PARCC	Precision, Accuracy, Representativeness, Completeness, Comparability
PCBs	Polychlorinated Biphenyls
PM <sub>10</sub>	Particulate matter less than 10 microns
ppb	Parts Per Billion
ppm	Parts Per Million
QA/QC	Quality Assurance/ Quality Control
QAMP	Quality Assurance Management Plan
QAPP	Quality Assurance Project Plan
RPD	Relative Percent Differences
RAS	Routine Analytical Services
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/ Feasibility Study
RD/RA	Remedial Design/ Remedial Action
RPM	Remedial Project Manager
SARA	Superfund Amendments and Reauthorization Act
SAS	Special Analytical Services
SMC	Sample Management Coordinator

SOP	Standard Operating Procedure
SRM	Standard Reference Materials
SOW	Statement of Work
SW846	Test Methods for Evaluating Solid Waste 1986.
TAL	Target Analyze List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TIC	Tentatively Identified Compound
TPH	Total Petroleum Hydrocarbon
TSP	Total Suspended Particulate Matter
USEPA	United States Environmental Protection Agency
VOA	Volatile Organic Analysis
VOC	Volatile Organic Compound
XRF	X-Ray Fluorescence



## **1.0 PROJECT DESCRIPTION**

### **1.1 INTRODUCTION**

This Quality Assurance Project Plan (QAPP) has been developed by ENTACT & Associates, LLC (ENTACT) for the Master Metals, Inc. Site for use in conjunction with the Removal Design/Removal Action (RD/RA) Workplan and Health and Safety Plan. These are distinct documents that form the project operations plan intended to guide field personnel, contractors, and other involved parties in all aspects of field operations. This QAPP will provide QA procedures for activities during the removal action performed in accordance with the 2002 Administrative Order of Consent (AOC) for the Master Metals Superfund Site located in Cleveland, Cuyahoga County, Ohio.

A Phase I Time Critical Removal (TCR) for lead-impacted materials has already been conducted at the MMI site to remove contamination that posed an immediate risk to human health. Following the Phase I TCR, the Phase II EE/CA investigation was performed to delineate and evaluate the nature and extent of lead contamination remaining at the site to determine the appropriate non-time critical removal action (RA) needed to address existing site conditions. The removal action covered under this QAPP will address the remaining lead contamination in soils within the site and along the site perimeter to complete all necessary remedial action in accordance with the AOC.

The United States Environmental Protection Agency (USEPA) policy requires that all remedial activities be under the control of a centrally managed QA program. This requirement applies to all environmental monitoring activities supported by the EPA. Each contractor that generates data has full responsibility to implement minimum procedures to ensure that precision, accuracy, representativeness, completeness, and comparability of these data are known. To meet this objective, this site specific QAPP has been prepared detailing QA/QC procedures to ensure data generated during the remedial activities are accurate, precise, comparable and complete and therefore, representative of site conditions.

This QAPP will serve as a controlling mechanism during the performance of the sampling and analysis activities to detail procedures to ensure that technical data gathered during the construction phase of the interim measures are accurate, precise, complete, and representative of actual field conditions and meet minimum requirements of the design. All QA/QC procedures will be structured in accordance with applicable technical standards, EPA requirements, and regulations in general accordance with the USEPA Region 5 Model RCRA QAPP guidelines.

### **1.2 SITE/FACILITY DESCRIPTION**

#### **1.2.1 Location**

The Master Metals Site (the "Site") encompasses approximately 4.3 acres in the "flats" area of downtown Cleveland, a heavily industrialized sector of the city. The Site includes the former Master Metals Inc. lead facility (the "Facility") located at 2850 West Third Street, Cleveland and stockpiled soils removed from the surrounding contaminated residential property at 1157, 1159 and 1167 Holmden Avenue (the "Holmden Properties") where lead-impacted material from Master Metals was deposited as fill (USEPA, 1999). Railroad tracks border the site on two sides and the LTV Steel facility lies to the east and south. The Cuyahoga River is located approximately 1,500 feet to the east and athletic field and playground are situated approximately 1,000 feet to the west. The nearest residential property to the former facility is

approximately 2,000 feet to the northwest. (USEPA, 1999).

### **1.2.2 Local Geology, Hydrology and Hydrogeology**

The glacial and post-glacial surficial material in the vicinity of the MMI site consists of tills, lacustrine, and fluvial deposits. The glacial deposits are generally less than 40 feet thick in the site area and overlay a Devonian/Pennsylvanian-aged bedrock consisting of unconsolidated shale and sandstone (E&E, 1993).

Site investigations conducted at the site between 1990 and 1998 indicate that fill is present beneath the site to an approximate depth of four feet, with native soils of silty clay found at five feet (WWC, 1990). The water table is encountered at an approximate depth of 10 feet (WWC, 1990).

## **1.3 SITE/FACILITY HISTORY**

### **1.3.1 General History**

The facility was constructed in 1932 on slag fill by National Lead Industries, Inc. (NL) who owned and operated the facility as a secondary lead smelter, producing lead alloys from lead-bearing dross and scrap materials. NL also engaged in battery cracking operations at this facility. In 1979, the facility was purchased from NL Industries by MMI who continued to run secondary lead smelter operations.

As part of their operations, the Master Metals facility received lead-bearing materials classified and regulated under Resource Conservation and Recovery Act (RCRA) as D-008 hazardous waste from off-site sources (USEPA, 1999). This waste was converted into lead ingots using pot and rotary furnaces equipped with baghouses to collect particulate matter from the furnace that consisted predominantly of lead dust. The sludge that accumulated in the furnaces after smelting was classified as K069 waste hazardous waste. Finished lead ingots were stored in a roundhouse at the north end of the property prior to shipment off-site.

Based on background information, the by-products produced from smelting operations included furnace flux, slag, dross, baghouse fines and furnace sludge (USEPA, 1999). With the exception of slag, which was tested and disposed of off-site, most of the lead-bearing by-products were recycled back into the furnace. Cooling water used in the operations was diverted to the City of Cleveland's sewer system.

On November 19, 1980, Master Metals filed a "Part A permit" pursuant to the newly-regulated RCRA requirement, and obtained an "interim status" under RCRA to operate specific waste piles and treatment units, as well as container-based storage area for the hazardous lead-bearing materials. On January 11, 1982, Master Metals filed for Chapter 11 bankruptcy through the U.S. Bankruptcy Court for the Northern District of Ohio but subsequently went into reorganization and operations at the facility continued. Though Master Metals had submitted a Part B RCRA application sometime prior to November 8, 1985, on that date the facility lost interim status for the hazardous lead-bearing waste piles at the facility for failure to comply with financial requirements of 40 CFR Part 265, Subpart H.

Violations relating to poor operating practices are documented in various state and federal agency reports. On June 15, 1987, a complaint of violations of RCRA was filed by the United States seeking closure of the D008 and K069 waste piles. In response to this action, Master Metals and the U.S. entered a Stipulation to resolve these RCRA violations as well as financial responsibility

### **1.3.2 Past Regulatory and Data Collection Activities**

Numerous investigations have been conducted by MMI at the facility between 1990 to 1998 to determine the nature and extent of constituents of concern related to former operations. These investigations are summarized in the following subsections.

#### ***1.3.2.1 Compliance Technologies, December 1990***

Compliance Technologies, Inc. (CTI) conducted a Phase II environmental assessment of the MMI site from December 3 through December 11, 1990. The investigation included the advancement of 31 soil borings to a maximum depth of 10 feet, and the installation of four monitoring wells to a depth of 15 feet to evaluate subsurface and groundwater conditions beneath the MMI facility and determine the impact of prior slag disposal/landfill activities on these media (CTI, 1991b).

Forty-four subsurface soil samples were collected from 31 borings located in or near the MMI facility. The samples were collected from depths ranging between two to ten feet below ground surface (CTI, 1991b). The soil samples were submitted to BHM Analytical Laboratory, Chagrin Falls, Ohio and analyzed for eight RCRA metals, including arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver. The analytical results showed on-site lead concentrations ranging from 18.1 mg/Kg to 14,070 mg/Kg, with lead levels one to two orders of magnitude above the other metals detected. Off-site concentrations of lead in subsurface samples ranged from 7.85 to 55 mg/Kg. Slightly elevated concentrations of chromium and cadmium were observed in only 17 of the 44 samples. Sample locations and the associated lead concentrations are shown in Figure FSAP 1.

Groundwater was reported to be present between three to ten feet across the relatively flat facility. Four groundwater samples were collected from the newly-installed monitoring wells on December 28, 1990 using hand bailers and were not filtered. Total lead concentrations ranged between 0.45 mg/L to 1.39 mg/L.

In addition to the soil samples, two samples were collected the brick and slag material and analyzed for the TCLP 8 RCRA Metals, reactive sulfide, total cyanide, pH and flash point to determine if these materials were hazardous by characteristic (CTI, 1991b). Lead was present in the slag material at 7,075 mg/Kg with leachable lead detected in the slag material at 16.1 mg/L.

#### ***1.3.2.2 Ecology & Environment, July 1992***

On July 14, 1992, Ecology and Environment (on behalf of the U.S. EPA) collected seven surface samples on-site (SS1 - SS7) and three off-site surface soil samples from outside the fence to the east, south and west (SS8 - SS10) as part of a site assessment and hazard evaluation of the MMI facility. All soil samples were submitted to American Environmental Laboratories, Inc. of Bedford, Ohio for analysis of the eight RCRA metals.

Lead concentrations in the on-site surface soil samples ranged from 6,020 to 115,000 mg/Kg. Off-site surface soil samples collected outside the fence showed lead concentrations ranging between 24,000 to 43,100 mg/Kg (E&E, 1992). Sample locations and the associated lead levels are presented in Figure 1-2. Once again, lead values were 1-2 orders of magnitude higher than the seven other metals. Some results

exhibited minor arsenic, barium, cadmium, and chromium concentrations, relative to the co-located lead concentrations (E&E, 1992).

In July 1992, Ecology and Environment (on behalf of U.S. EPA) collected samples proximate to the facility property to determine if the facility contaminants were subject to airborne transport. Analysis of these samples (SS8 - SS10) for RCRA metals showed total lead levels of 24,000 - 43,100 ppm (see Figure 2-1).

#### ***1.3.2.3 Phase I Time Critical Removal***

As part of the time-critical removal, all exposed on-site surface areas (e.g., not covered by concrete) were excavated to a maximum depth of two feet or until slag fill material (e.g., slag, cinders, etc.) were encountered, whichever came first. XRF information collected from the floor of the excavations exhibited lead concentrations up to 39,000 ppm in the remaining slag fill material. The TCR also included the demolition, decontamination and off-site transportation of former facility structures. The activities are summarized in Section 1.4.1 of the RD/RA Workplan.

#### ***1.3.2.4 Phase II Engineering Evaluation and Cost Assessment***

The on-site soil sampling included the advancement of seven borings on-site. Results indicated that 5 of the 7 borings exceeded 1,500 mg/Kg lead at total depth. Historic slag was encountered at approximately three to four feet which is consistent with the information collected during the Phase I TCR (ENTACT, 1998b). The soil sampling locations are illustrated in Figure 1-3 of the RD/RA Workplan. The on-site sampling indicated that significant lead concentrations, up to 35,000 mg/Kg, remained in on-site soils to a depth of 3 to 4 feet. These areas were either covered with the existing concrete surface or had been excavated and backfilled with 2 feet of clean fill as part of the Phase I TCR. Therefore in areas where the concrete was competent and in uncovered areas that were excavated as part of the Phase I TCR, the potential for further entrainment of airborne lead had been mitigated and was no longer considered a concern (ENTACT, 1998b). However a potential for airborne lead releases did exist in areas where the concrete was compromised. These areas were recommended for repair to mitigate this airborne migration route (ENTACT, 1998b).

A perimeter surface soil survey was conducted adjacent to the fence line along the western, eastern and southern boundaries of the MMI facility property using an XRF instrument, at nineteen locations designated in Figure 1-3. Results of the perimeter lead survey showed lead levels ranging from 931 ppm to 36,587 ppm within the upper 12 to 24 inches of soils, decreasing rapidly with depth. The surficial elevated lead levels currently pose a potential ingestion or inhalation threat, and were recommended for further remedial action (ENTACT, 1998b).

Off-site sampling included the collection of nine off-site surface soil samples along Quigley Avenue. The results showed levels of the average lead concentrations to be below the Superfund residential soil screening level of 400 mg/Kg indicating potential airborne lead impacts from the former MMI facility are minimal. No further action was recommended (ENTACT, 1998b).

Groundwater sampling conducted in 1991 showed total lead concentrations ranging from 0.45 mg/L to 1.35 mg/L, total chromium concentrations ranging from 0.02 mg/L to 1.33 mg/L and lesser concentrations of arsenic and cadmium (CTI, 1991). Groundwater sampling of the three existing monitoring wells during the 1998 EE/CA investigation showed the presence of lead, arsenic, cadmium

and chromium at levels that have either remained at, or have declined from, the 1992 sampling results. Groundwater is not used as a source of drinking water within a four-mile radius of the site, with Lake Erie supplying the greater Cleveland area with its drinking water supply. Based on the low concentrations of metals in the groundwater and the lack of any potential downgradient receptors, the groundwater migration pathway was eliminated as a concern (ENTACT, 1998b).

The EE/CA assessment verified that lead was the predominant hazardous constituent of concern at the site, with lesser occurrences of arsenic. Removal action directed at lead exceedences would also address the co-located elevated levels of arsenic. Based on a streamlined risk evaluation, a risk-based remediation goal (RBRG) for lead of 1,000 mg/Kg was established for on-site and off-site perimeter soils (ENTACT, 1998b). Based on the EE/CA results this final removal action has been designed to address the remaining lead impacts associated with former facility operations.

### **1.3.3 Current Status**

Based on the findings of the Phase II EE/CA, an AOC was entered into between the USEPA and the PRP Respondent Group in Spring 2002 to perform a non-critical removal action outlined in the Statement of Work (SOW) to address remaining lead impacts at the site that are associated with former facility operations. In accordance to the revised Statement of Work (SOW), the following tasks are to be completed as part of this AOC:

- Clear and grub areas requiring excavation of all trees and brush for disposal off-site.
- Demolish above-grade concrete and metal structures remaining on-site after the Phase I TCR demolition activities in accordance to the design specifications. Sized concrete construction debris will either be used as a sub-base material in areas to be covered with the asphalt cover or will be transported off-site disposal as construction debris. All wood, bricks or metal debris that are removed will be disposed of off-site as construction debris.
- Establish a coordinate grid system along the perimeter of the property outside the fence line and in on-property areas where excavation is required.
- Excavate off-property soils along the western, eastern and southern perimeter of the MMI facility, that exceed the RBRG of 1,000 mg/Kg or until historic slag fill material is encountered, whichever comes first. XRF screening technology will be used to guide the depth of the excavations during removal.
- Excavate designated on-property soils that are not under concrete or the proposed asphalt cover (including grids I1, J1 and K1 excavated during the Phase I TCR) that exceed the RBRG of 1,000 mg/Kg or until historic slag fill material is encountered, whichever comes first.
- Conduct confirmatory soil sampling from the excavation floor in grids where the excavation was terminated prior to reaching the historic slag fill material to confirm that all soils that are above the cleanup level have been excavated and removed.
- Backfill all excavated areas once verified to have met the RBRG or have reached historic slag fill, and grading to promote positive drainage in accordance with the design documents. Backfill for areas

not covered by asphalt or concrete will be filled with clean imported fill material that has been approved for use based on analytical results and is suitable to maintain vegetative growth.

- Stabilize excavated soils to meet the applicable LDRs for contaminated soils for lead, and any underlying hazardous constituent (UHC) during waste profiling, to render the material nonhazardous for either use as fill in low areas beneath the proposed asphalt cover or for off-site disposal at an approved Subtitle D facility.
- Conduct verification sampling of treated soils using TCLP lead analysis to verify the material has been rendered non-hazardous for lead prior to either placement in low areas beneath the proposed asphalt cover or for off-site disposal as nonhazardous waste.
- Off-site disposal of all treated soils not used to fill low areas beneath the proposed asphalt cover, including stockpiled soils from the Holmden Properties Removal Action, in accordance with the SOW and the approved design plan.
- Place an asphalt cover over the deteriorated area of the concrete located in southern portion of the site in accordance with the design documents.
- Recondition existing concrete surfaces not under the asphalt cover by sealing any significant cracks and breaks that extend through the concrete surface, followed by encapsulation of the concrete surface, in accordance with the approved design plan.
- Abandon of all existing monitoring wells on site in accordance to applicable State of Ohio regulations (OAC-3745-9-10 ).
- Remove any existing solid waste including Investigative Derived Waste (IDW) from previous or current removal actions.
- Install a perimeter chain-link fence and three double-swing gates at the completion of the RA to control site access at the site in accordance with the design documents.
- Development of an Operation and Maintenance (O&M) Plan to ensure the integrity of the remedy by maintaining and repairing the concrete and asphalt cover, and the perimeter fencing for a period of thirty (30) years, and as specified in the AOC.

#### **1.4 PROJECT OBJECTIVES AND INTENDED DATA USAGES**

The primary objective of the removal action (RA) at the MMI Site is to address the lead-contaminated soils that have been determined to be a threat to human health and the environment. The RA for this site, defined in the AOC, has been designed to reduce the potential threat to human health from lead exposure based on the intended future land use for both the site and surrounding areas. The boundaries of the RA include the 4.3-acre site and the adjacent off-site perimeter property as defined in the revised SOW.

The purpose of the data to be generated as part of this RA and covered under this QAPP is to verify that the removal performance standards for all associated RA tasks have been met in areas identified in the

revised SOW. These performance standards are discussed in the Performance Standard Verification Plan (Appendix B to the RD/RA Workplan). For this project, the tasks and associated performance standards are detailed in Section 1.3.3.

In addition, sufficient data will be gathered during project activities to verify that the performance standards associated with the short-term implementation of the RA (i.e., air sampling, any necessary wastewater or waste characterization sampling for off-site disposal, sampling of backfill material etc.) as described in the FSAP (Appendix C of the RD/RA Workplan), are met. The list of the RA activities and intended data usage is presented in Section 1, Table QAPP-1.

Data collected as part of the removal action will need to meet the Data Quality Objectives (DQOs) applicable for the end use of the data that was collected. As such, different data uses may require different levels of data quality. DQOs are qualitative and quantitative statements that specify the quality of results required to support decisions made during the project and have been in accordance with the Quality Objectives Interim Guidance Document (EPA QA/G-4).

The three types of DQOs identified for use at the site include the following:

- Screening (DQO Level 1): This provides the lowest data quality but the most rapid results. It will be used for field screening and health and safety monitoring at the site, and preliminary comparison to ARARs. This type of data will be used for the X-Ray Fluorescence (XRF) instrument and air monitoring equipment at the site.
- Engineering (DQO Level 3): This provides an intermediate level of data quality and is used for site characterization. Engineering analyses may include laboratory data with quick turnaround times used for screening but without full quality control documentation. This type of data will be used for backfill characterization, wastewater characterization, if needed, air monitoring, and waste characterization.
- Confirmational (DQO Level 4): This provides the highest level of data quality and is used for purposes of risk assessment, evaluation of remedial alternatives and verification that performance standards have been met. This requires full analytical and data validation procedures in accordance with EPA recognized protocol. This type of data will be used for all confirmatory soil sampling and treatment verification sampling to verify that performance standards have been met.

#### **1.4.1 Project Target Parameters**

A summary of the project tasks, the associated sampling parameters and the intended data usage are presented in Section 1, Table QAPP-1. Holding time and preservation required for these samples is presented in Table FSAP-1, Appendix C of the RD/RA Workplan.

Specific tasks are described in the following sections.

##### ***1.4.1.1 Excavation of Lead-Impacted Soils***

Excavation of site soils will be performed on an estimated 40 sample grids. The XRF field-screening device will be used to measure lead concentrations in soils to guide the lateral and vertical extent of the excavation in each grid. Excavation will proceed until either the RBRG of 1,000 mg/Kg has been met or

until historic slag is encountered (maximum depth), whichever comes first. Though soils will be field screened using an X-Ray Fluorescence analyzer during excavation activities, the XRF will NOT be used to verify that performance standards have been met. Utilization of this field-screening device will allow for more expedient decision-making regarding volume of material present requiring excavation, and treatment to render the material nonhazardous. This utilization will increase project efficiency. The XRF analyzer will be calibrated and compared to known standards on at least a daily basis in accordance with the standard operating procedure (SOP) for the XRF as presented in Attachment FSAP-1 of the Field Sampling and Analysis Plan.

If the XRF indicates the performance standard has been met prior to reaching the historic slag fill, a post-excavation confirmatory sample will be collected from the floor of the excavation in that grid to verify that the lead concentration is below 1,000 mg/Kg total lead RBRG. Samples will be collected in the center of each grid and submitted for laboratory analysis of total lead. A detailed discussion of the post-excavation confirmatory sampling methodology is provided in Appendix C, Field Sampling and Analysis Plan of the RD/RA Workplan. If the level of lead in the soil is confirmed by the laboratory to be below the performance standard, no further excavation in the grid will occur and the grid will be backfilled with clean fill material. If the confirmatory sample indicates that the performance standard has not been achieved, additional excavation will be conducted in that grid until either the RBRG has been met or until historic slag is encountered.

#### ***1.4.1.2 Stabilization of Lead-Impacted Soils***

Treatment is required of excavated soils on-property and along the site perimeter to render the material nonhazardous prior to either filling low areas beneath the asphalt cover or off-site disposal. The soils will be treated using a treatment system and additive blend that has been determined to be effective during the Treatability Study as presented in Appendix E of the RD/RA Workplan. The soils will be treated to meet the nonhazardous criterion of <5.0 mg/L TCLP lead.

The treated soils to be disposed of off-site will be transported to an approved Subtitle D landfill facility. As defined in 40CFR 268.45(c)(1)(C), the treated soils will meet the Land Disposal Restriction (LDR) standard of 10 times the Universal Treatment Standard for the primary hazardous constituent (<7.5 mg/L TCLP lead) and any underlying hazardous constituents (UHCs) that may be identified during the waste profiling. The treated soils will also be less than the hazardous characteristic level for lead (<5.0 mg/L TCLP lead) or any other identified UHC to allow for off-site disposal as nonhazardous waste.

#### ***1.4.1.3 Backfilling***

Following excavation in areas outside the asphalt or concrete cover, clean imported fill will be used to bring the site back to grade then vegetated. The backfill material will be tested prior to use. Analytical parameters are listed in Table QAPP-1. The frequency and sampling methodology for backfill sources are presented in Table QAPP-2, Field Sampling and Analysis Plan, Appendix C of the RD/RA Workplan

#### ***1.4.1.4 Air Monitoring***

During removal activities, air monitoring will be performed for Total Suspended Particulate (TSP) and total lead particulate to ensure that the performance standard outlined in the SOW and the National Ambient Air Quality Standards are not exceeded. Personal and area air monitoring for lead will also be conducted to ensure worker safety. Air monitoring is also discussed in Section in Section 4.0 of the



FSAP (Appendix C of the RD/RA Workplan) and Section 7.0 of the HASP.

#### **1.4.1.5      *Waste Characterization***

Based on the actual volume of stabilized soils that will need to be placed beneath the cap, some soils may be transported off-site for disposal as nonhazardous waste at an approved Subtitle D landfill facility, in accordance with the Final Design. In accordance to the SOW, and described in Section 1.4.1.2, contaminated soils deemed to be hazardous will be treated to not only meet the LDR standard of 10 times the Universal Treatment Standard (or 7.5 mg/L TCLP lead) as defined in 40CFR 268.45(c)(1)(C), but also to be less than the hazardous characteristic lead level (<5.0 mg/L TCLP lead) to allow for off-site disposal as nonhazardous waste. Therefore contaminated soils requiring treatment will be stabilized to nonhazardous levels (< 5.0 mg/L) using the TCLP test to measure compliance, and shipped off-site for disposal in an approved Subtitle D landfill.

Construction debris associated with demolition of above-ground concrete structures will be pressure-washed and disposed of off-site at an approved facility. Any other investigative-derived waste will be disposed in accordance to all applicable federal and state requirements.

#### **1.4.1.6      *Wastewater Characterization***

Any bulked decontamination water or water pumped from excavation areas or open pits that is not used for dust control measures will be tested for applicable Northeast Ohio Regional Sewer District (NEORS) analytical parameters to allow for discharge to the sewer system with approval from the NEORS.

#### **1.4.2      *Field Parameters***

During the implementation of the RA, XRF field screening for lead will be conducted to guide the depth of excavations. Other various field-monitoring activities will be conducted to collect information regarding worker health and safety and to evaluate the effectiveness of fugitive dust controls at the site.

Air monitoring will be conducted within the work area and along the perimeter of the work area. The air monitoring locations will be established based on wind and weather data collected on a daily basis. Air monitoring and sampling will be performed as described in the Field Sampling and Analysis Plan (Appendix D of the RD/RA Workplan).

Acceptable limits of field instrument screening errors are presented in Section 8, Table QAPP-8.

#### **1.4.3      *Laboratory Parameters***

The primary purpose of the RA data collection is to gather sufficient information to verify that the performance standards outlined in the PSVP have been achieved. These standards include the RBRG for total lead in soils of 1,000 mg/Kg or the presence of historic slag, whichever is encountered first, and a treatment standard of <5.0 mg/L TCLP lead to render the excavated material nonhazardous waste. A summary of the laboratory parameters for each task and the associated QC samples are provided in Section 3.0, Table QAPP-2.

The detailed design of each sampling program, procedures and methods that will be used to acquire the data for air and soils is presented in Appendix C, Field Sampling and Analysis Plan of the RD/RA Workplan.

Acceptable limits on decision errors used to establish the sampling results are provided in Attachment QAPP-C.

## **1.5 SAMPLE NETWORK DESIGN AND RATIONALE**

Total lead analyses will be used as the indicator for contaminant removal and surficial and subsurface soils at the site. Previous sample results from this site, coupled with experience from similar sites, indicate that not only is lead the predominant contaminant, it is a good general indicator of removal of other metals that may be co-located at the site.

Air monitoring parameters were chosen based on known contaminants and the nature of the work. Since excavation activities will be taking place, airborne contaminants are the major concern.

Table QAPP-2 in Section 3.0 of the QAPP summarizes the project samples to be taken by task, the matrix to be analyzed, the parameters to be analyzed, and the frequency of collection. Project specific reporting limits are presented in Section 7.0, Tables QAPP-3 through QAPP-7.

## **1.6 PROJECT SCHEDULE**

The removal activities as described in the RD/RA Workplan will require approximately six weeks to complete. Refer to the Figure 3 of the RD/ RA Workplan for a detailed schedule of specific tasks.

**TABLE QAPP-1**  
**Intended Data Usage**

ACTIVITY	DESCRIPTION	PARAMETERS	INTENDED DATA USAGE
Perimeter Air Monitoring	Air	Lead , TSP	Health monitoring Monitor fugitive lead and particulate emissions on-site and perimeter
Lead-Impacted Soils	Soil	XRF Lead Total Lead	Determine the vertical and horizontal extent of lead impacted soils until either the RBRG of 1,000 mg/Kg lead is met or until historic slag is encountered, whichever comes first.
Excavated soil treatment	Stabilized lead-impacted soils	TCLP Lead	Verify the treatment standards for contaminated lead-impacted soil (7.5 mg/L) are met and ensure material is rendered nonhazardous (< 5.0 mg/L) for on-site placement and consolidation.
Backfill Material Sampling	Soil (Imported Fill)	8 RCRA Metals VOCs Pesticides/PCBs TPH	Characterize imported fill material prior to use as backfill in excavated areas.
Waste Characterization Sampling for Disposal	Stabilized Soils	Waste Profile Parameters requested by Landfill	Characterize waste for off-site disposal to a nonhazardous Subtitle D Landfill facility
Wastewater Characterization Sampling for Disposal, if necessary	Bulked Wastewater	NEORD's Discharge Parameter List	Characterize wastewater to determine if it can be discharged to the city sewer system.

## **2.0 PROJECT ORGANIZATION AND RESPONSIBILITY**

### **2.1 PROJECT ORGANIZATIONAL CHART**

Figure 2-1 of the RD/RA Workplan illustrates the lines of authority of the Removal Action Management Team for overseeing and implementing the required removal activities at the MMI site in Cleveland, Ohio.

ENTACT's assigned management team may change during implementation of the RA. If there is a change in personnel of ENTACT's management team, the modification will be communicated to US EPA's RPM and the Project Coordinator.

### **2.2 MANAGEMENT RESPONSIBILITIES**

#### **USEPA CERCLA Project Manager, Gwen Massenberg**

The USEPA CERCLA Project Manager has the overall responsibility for all phases of the Remedial Action Workplan.

#### **Project Coordinator, Terry Casey, Efficasey Environmental LLC**

The Project Coordinator's prime responsibility will be to ensure proper coordination among various project stakeholders. These stakeholders include the USEPA, OEPA, City of Cleveland, NOLTCO, Bredt & Zanick, LLC, the Project Manager, and the Respondents to the Order.

#### **Project Manager, Mike Stoub, ENTACT:**

Mr. Stoub will have the overall responsibility for ensuring that the remedial activities are implemented and completed in accordance with the AOC, revised Statement of Work, the U.S. EPA-approved RD/RA Workplan and federal, state, and local regulations. Specific responsibilities of the Project Manager will include, but not be limited to, the following:

- Providing personnel and equipment for remedial activities;
- Ensuring the RA is completed with the approved schedule;
- Ensuring effective communications between the Project Coordinator and U.S. EPA's RPM;
- Ensure that all documents and reports that ENTACT is required to generate meets the requirements of the approved workplan;
- Communicate any request for modifications to the approved workplan to the Project Coordinator and U.S. EPA; and
- Promptly notifying the Project Coordinator and U.S. EPA's RPM in the event of unforeseen field conditions and/or problems are encountered.

#### **Field Project Manager, Bob Ainslie, ENTACT, Inc.**

Mr. Ainslie will work with the Project Manager in overseeing the removal activities at the site and ensuring that the site activities are implemented and completed in accordance with the AOC, Statement of Work, the

U.S. EPA-approved RA Workplan and federal, state, and local regulations. Specific responsibilities of the Project Coordinator will include, but not be limited to, the following:

- Providing the Project Manager and USEPA's RPM the names and qualifications of contracted laboratory, disposal facilities, recycling facilities, and transporters used to implement the RA;
- Ensuring that ENTACT's associates perform their designated duties in accordance with the Health and Safety Plan;
- Ensuring required quality assurance/quality control procedures are properly implemented and documented;
- Notifying appropriate personnel identified in the Health & Safety Plan in the event of spills or air releases that exceed criteria;
- Working with the Project manager in ensuring the RA is completed following the approved schedule;
- Notifying appropriate personnel identified in the Health & Safety Plan in the event of spills or air releases that exceed criteria;
- Communicating any request for modifications to the approved workplan to the Project Coordinator and USEPA; and
- Promptly notifying the Project Manager and the USEPA's RPM in the event of any unforeseen field conditions and/or problems that are encountered.

**Regulatory/Technical Leads, Pat Vojack, P.G., Mark Waxali P.E., ENTACT & Associates LLC**

Ms. Vojack and Mr. Waxali will provide regulatory, technical and engineering support to the Project Manager in ensuring that the site activities are implemented and completed in accordance with the AOC, SOW, the U.S. EPA-approved RA Workplan and federal, state, and local regulations. They will also provide technical support to the Field Manager in the areas of wastewater management and treatment, solid and hazardous waste management, air and groundwater monitoring, and any other technical design requirements for the RA.

**Corporate Health and Safety Director, Mr. Jonathan Patlak, ENTACT & Associates LLC**

The Corporate Health and Safety Officer will coordinate and provide oversight for the Health and Safety issues at the site. He will be responsible for conducting the Health and Safety Orientation meeting before the RA is implemented. He will review weekly health and safety updates from the site and conduct several inspections at the site during the RA.

***Management Control Process***

The ENTACT Project Manager has overall responsibility for successfully completing the remedial action at the site. This includes safely completing technical Statement of Work items, fulfilling contractual obligations, compliance with the approved workplan, and meeting all or exceeding the established project schedule and budget. The Project Manager will accomplish these objectives by monitoring the work progress, reviewing and planning each project task with experienced technical staff and the Field Project Manager, and ensuring the appropriate and sufficient resources are available to the Field Project Manager and the On-Site QA/QC Officer.

The Project Manager will receive daily progress reports from site personnel appraising him of the status of planned, ongoing, and completed work, including QA/QC performance and health and safety, site-specific issues. In addition, the Project Manager will be apprised of any potential problems and recommendations for solutions and/or corrective action.

Qualifications and experience of ENTACT's Management Team are provided in Attachment QAPP-A of the QAPP.

## **2.3 QUALITY ASSURANCE RESPONSIBILITIES**

### **US EPA Region 5 Superfund's Quality Assurance Coordinator**

U.S. EPA Superfund Quality Assurance Reviewer has the responsibility to review and approve all Quality Assurance Project Plans. In addition, the U.S. EPA Quality Assurance Coordinator is responsible for conducting external performance and system audits of the laboratory and evaluating analytical field and laboratory procedures.

#### **Quality Assurance Manager, Patricia Vojack, P.G., ENTACT- & Associates LLC**

The ENTACT QA Manager will be responsible for ensuring that all ENTACT procedures for this project are being followed. In addition, the ENTACT QA Manager will be responsible for the data validation of all sample results from the analytical laboratory. Specific responsibilities will include, but are not limited to, the following activities:

- Ensuring required quality controlled testing is performed and documented and the results are provided to the ENTACT's project management team, the Project Manager, and U.S. EPA in accordance with the requirements of the approved workplan;
- Providing oversight and direction to the on-site quality assurance official; and,
- Providing assistance in the modification of QA methodology or implementation based on conditions encountered during the remedial activities; if different than specified in the approved QAA.

#### **On-Site QA Officer, Field Engineer, ENTACT- & Associates LLC**

The on-site QA officer will be responsible for performing required quality control testing at the site. The on-site Quality Control Officer will operate independently of ENTACT's Project Manager and Field Project Manager. The QA/QC Officer will communicate any QA/QC issues related to the site to the Project Manager. The QA/QC officer will have the authority to correct and implement additional measures to assure compliance with the approved workplan, including the QAPP. Specific responsibilities will include:

- Adhere to the approved QAPP;
- Document any deviations to the plan with a justification for the deviations, and if necessary appropriate notification in accordance with the approved workplan;
- Secure necessary sampling tools, bottles, packaging/shipping supplies, chain-of custody documents, etc. in accordance with the approved workplan;
- Collect or direct the collection and ship samples at the frequencies and for laboratory analysis parameters

specified in the QAPP;

- Document the location, time, and date of all samples that are collected and shipped to the laboratory;
- Interface with the superintendents such that the sample collection is coordinated with the general progression of the work;
- Notify the project manager, project coordinator and the U.S. EPA of any sampling activities associated with the implementation of the approved workplan; and
- Obtain analytical results and reporting the data to the Project Manager, Project Coordinator, and U.S. EPA's RPM.

## 2.4 LABORATORY RESPONSIBILITIES

The laboratories which will be performing the sample analysis for this project, except for air samples, is:

GeoAnalytical, Inc.  
9263 Ravenna Road  
Twinsburg, OH 44087  
Phone (330) 963-6990

The laboratory performing the air monitoring analysis is:

Pace Analytical Services, Inc.  
7726 Moller Road  
Indianapolis, IN 46268  
Phone (317) 875-5894

### **GeoAnalytical Project Manager, Amy Onest**

The GeoAnalytical Project Manager will report directly to the ENTACT QC Manager and will be responsible for ensuring that all resources of the laboratory are available on an as required basis. She is also responsible for the overview of final analytical reports.

### **GeoAnalytical Quality Assurance Officer, Terrence M. Harper**

The Quality Assurance Officer has the overall responsibility for data after it leaves the laboratory. The GeoAnalytical QA Officer will communicate data issues through the GeoAnalytical Project Manager. In addition, the GeoAnalytical QA Officer will overview laboratory quality assurance and QA documentation, conduct detailed data review, determine whether to implement corrective action, and define appropriate laboratory procedures.

### **GeoAnalytical Sample Custodian**

The GeoAnalytical Sample Custodian will report to the GeoAnalytical Project Manager. The GeoAnalytical Sample Custodian responsibilities will include: receiving, recording and inspecting the incoming samples; verifying chain-of-custody and its accuracy; notifying laboratory manager and supervisor of sample receipt and inspection; assigning a unique identification number and customer number, and entering each into the

sample receiving log; and transferring samples to the appropriate lab section.

### **GeoAnalytical Technical Staff**

The GeoAnalytical Technical Staff will be responsible for sample analysis and identification of corrective actions.

Qualifications and experience of GeoAnalytical Inc. QA/QC Management Team are provided in Attachment QAPP-A of the QAPP.

### **Pace Analytical Project Manager, Jill Kofoed**

The Pace Analytical Project Manager will report directly to the ENTACT QC Manager and will be responsible for ensuring that all resources of the laboratory are available on an as required basis. She is also responsible for the overview of final analytical reports.

### **Pace Analytical Quality Assurance Officer, Tim Harrison**

The Quality Assurance Officer has the overall responsibility for data after it leaves the laboratory. The Pace Analytical QA Officer will communicate data issues through the Pace Analytical Project Manager. In addition, the Pace Analytical QA Officer will overview laboratory quality assurance and QA documentation, conduct detailed data review, determine whether to implement corrective action, and define appropriate laboratory procedures.

### **Pace Analytical Sample Custodian**

The Pace Analytical Sample Custodian will report to the Pace Analytical Project Manager. The Pace Analytical Sample Custodian responsibilities will include: receiving, recording and inspecting the incoming samples; verifying chain-of-custody and its accuracy; notifying laboratory manager and supervisor of sample receipt and inspection; assigning a unique identification number and customer number, and entering each into the sample receiving log; and transferring samples to the appropriate lab section.

### **Pace Analytical Technical Staff**

The Pace Analytical Technical Staff will be responsible for sample analysis and identification of corrective actions.



### **3.0 QUALITY ASSURANCE (QA) OBJECTIVES FOR MEASUREMENT DATA**

The overall QA objective for this project is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results, which are legally defensible in a court of law. The purpose of implementing these procedures is to assess the data generated for accuracy, precision, representativeness, completeness, and comparability for both the laboratory analytical program and field sample collection activities. The primary goal of the program is to ensure that the data generated are representative of environmental conditions at the site. To obtain this goal, a combination of statistical procedures and qualitative evaluations will be used to check the quality of the data.

Precision, accuracy, representativeness, completeness, and comparability (PARCC) will be computed in the manner described in the following paragraphs. A qualitative assessment of PARCC factors will be made and will be documented. Specific procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal quality control, audits, preventative maintenance of field equipment, and corrective action are described in other sections of this QAPP.

#### **3.1 PRECISION**

The precision of laboratory results and field sampling efforts will be evaluated by examining laboratory and field QC sample results. Analytical precision will be evaluated for analytical methods by comparing the QC criteria stipulated in the standard operating procedures to the results from laboratory matrix spike/matrix spike duplicate samples and field duplicate samples.

##### **3.1.1 Definition**

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions, usually expressed in terms of the standard deviation.

##### **3.1.2 Field Precision Objectives**

Field precision is assessed through the collection and measurement of field duplicates at a rate of 1 duplicate per 10 investigative analytical samples.

##### **3.1.3 Laboratory Precision Objectives**

Precision in the laboratory is assessed through the calculation of relative percent differences (RPD) for replicate samples. The equations to be used for precision in this project can be found in Section 12 of this QAPP. Precision control limits are given provided in tables in Section 8 Attachment QAPP-C.

### **3.2 ACCURACY**

The accuracy of the analytical data will be assessed by examining the results obtained from the analysis of sample blanks, duplicate samples, laboratory matrix spike/matrix spike duplicate samples, and method

required laboratory QA/QC samples. One equipment blank will be prepared and documented for every 10 investigative samples. One matrix spike, and one matrix spike duplicate will be analyzed for every 20 investigative samples. Data will be qualified in accordance with the appropriate EPA functional guidelines for evaluating data if either field QC blanks or laboratory QC blanks indicate that the accuracy or precision of analytical results is compromised. Field blanks will only be collected if disposable sampling equipment is used to verify that decontamination procedures are adequate and not biasing data. It is not anticipated that any disposable sampling equipment will be used.

### **3.2.1 Definition**

Accuracy is the degree of agreement of a measurement with an accepted reference or true value.

### **3.2.2 Field Accuracy Objectives**

Accuracy in the field is assessed through the use of field blanks and adherence to all sample handling, preservation, and holding times.

### **3.2.3 Laboratory Accuracy Objectives**

Laboratory accuracy is assessed through the analysis of matrix spikes (MS) or standard reference materials (SRM) and the determination of percent recoveries. The equation to be used for accuracy in this project can be found in Section 12 of this QAPP. Accuracy control limits are provided in Attachment QAPP-C of the QAPP.

## **3.3 COMPLETENESS**

### **3.3.1 Definition**

Completeness is the amount of valid data obtained from a measurement system compared to the amount that was expected and required to meet the project data goals.

### **3.3.2 Field Completeness Objectives**

Field completeness is the measurement of the amount of valid measurements obtained from all the measurements taken in the project. The intent of this program is to attempt to achieve a goal of 100 percent completeness. Realizing that under normal conditions this goal may not be achievable, the completeness goal for this program is 90 percent. ~~Residential well sampling completeness will be 100%.~~ This completeness goal is considered adequate to meet the data quality objectives for this site based on prior consideration of PARCC parameters, the sampling design plans, and data collection activities proposed for each medium. In developing the sampling design plan, critical data points were carefully considered and identified to help ensure comparability of data. The equation for completeness is presented in Section 12 of this QAPP.

### **3.3.3 Laboratory Completeness Objectives**

Laboratory completeness is a measure of the amount of valid measurements obtained from all the measurements taken in the project. The intent of this program is to attempt to achieve a goal of 100 percent completeness. Realizing that under normal conditions this goal may not be achievable, the completeness goal for this program is 90 percent. Residential well sampling completeness will be 100%. The laboratory equation for completeness is presented in Section 12 of this QAPP.

### **3.4 REPRESENTATIVENESS**

Representativeness expresses the degree to which sample data accurately and precisely represent environmental conditions and parameter variations at a sampling location. Representativeness is a qualitative parameter most concerned with the proper design of the sampling program. The representativeness criterion is best satisfied by assuring that sampling locations are properly selected and a sufficient number of investigative samples are collected.

#### **3.4.1 Definition**

Representativeness is the selection of analytical methods and sampling protocols and locations such that results are representative of the media being sampled and conditions being measured.

#### **3.4.2 Measures to Ensure Representativeness of Field Data**

Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Field Sampling and Analysis Plan (FSAP) is followed and that proper sampling techniques are used.

#### **3.4.3 Measures to Ensure Representativeness of Laboratory Data**

Representativeness in the laboratory is ensured by using the proper analytical procedures, meeting sample-holding times, and analyzing and assessing field duplicate samples. The sampling network was designed to provide data representative of facility conditions. During the development of this network, consideration was given to past waste disposal practices, existing analytical data, physical setting, and constraints inherent to the RA Workplan. The rationale of the sampling network is discussed in detail in the RA Workplan and Section 4 of this QAPP.

### **3.5 COMPARABILITY**

Comparability cannot be ensured through use of standard methods and protocols alone. In order to compare data, various important elements will be considered. During this project, three elements will be evaluated for data comparability. These three elements include analytical methods, quality of data, and sampling design. If after the initial evaluation, data do not appear comparable, the QA Manager will attempt to identify other components possibly affecting comparability, including but not limited to field conditions, sampling protocols, and the occurrence of true data anomalies.

### **3.5.1 Definition**

Comparability is an expression of the confidence with which one data set can be compared to another.

### **3.5.2 Measures to Ensure Comparability of Field Data**

Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the FSAP is followed and that proper sampling techniques are used.

### **3.5.3 Measures to Ensure Comparability of Laboratory Data**

Planned analytical data will be comparable when similar sampling and analytical methods are used and documented. Similar QA objectives will be used throughout the project to ensure comparability.

## **3.6 LEVEL OF QUALITY CONTROL EFFORT**

Field blank, duplicate, and matrix spike samples will be analyzed to assess the quality of data resulting from the field sampling and analytical programs.

### **3.6.1 Field Data**

Field blanks, for water samples, consisting of distilled water used to rinse decontaminated sampling equipment will be submitted to the analytical laboratory to provide a means to assess the quality of the data resulting from the field sampling program. Field blank samples are analyzed to check for procedural contamination at the facility that may cause sample contamination. Field blanks will be collected at a frequency of 1 per 10 water samples. Also, one field blank will be prepared for every 10 investigative samples if reusable sampling equipment is used. Sampling procedures are specified in the sampling portion of the RA Workplan and Section 4 of this QAPP.

The precision and accuracy of field measurements (such as pH, conductivity, etc) are discussed in Section 8.1 of the QAPP and listed in Table QAPP-8.

### **3.6.2 Laboratory Data**

Method blank samples are generated within the laboratory and used to assess contamination resulting from laboratory procedures. Field duplicate samples are analyzed to check for sampling and analytical reproducibility. Matrix spikes provide information about the effect of the sample matrix on the digestion and measurement methodology. All matrix spikes are performed in duplicate and are hereinafter referred to as MS/MSD samples. One MS/MSD will be analyzed for every 20 or fewer investigative samples per sample matrix.

TABLE QAPP-2

SUMMARY TABLE OF GRID SAMPLING AND ANALYSIS PROGRAM FOR THE REMOVAL ACTION  
MASTER METALS, INC. SITE, CLEVELAND, OHIO

Sample Type	Analysis Parameters	Investigative Samples			Field Quality Control Samples						MS/MSD <sup>1</sup>		Totals
		No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total
Post-Excavation Sampling	Laboratory ---- Total Lead	40	1	40	4	1	4	4	1	4	--	--	48
	Field ---- XRF Lead	160	1	160	--	--	--	--	--	--	--	--	160
Treatment Confirmation Sampling <sup>5</sup>	Laboratory ---- TCLP Lead	20	1	20	--	--	--	--	--	--	--	--	220
Backfill Testing <sup>3</sup>	Laboratory --- RCRA Metals <sup>2</sup>	2	1	2	--	--	--	--	--	--	--	--	5
	Laboratory --- VOCs	2	1	2	--	--	--	--	--	--	--	--	5
	Laboratory --- TPH 8	2	1	2	--	--	--	--	--	--	--	--	5
	Laboratory --- Pesticides/PCBs	2	1	2	--	--	--	--	--	--	--	--	5
Waste Characterization Sampling <sup>6</sup>	Laboratory ---- TCLP Lead	1+	1	1+	--	--	--	--	--	--	--	--	1+
Wastewater Sampling <sup>7</sup>	NEORS Discharge Parameters	4+	1	4+	--	--	--	--	--	--	--	--	4+

Air Monitoring TSP-total lead Respirable Dust Refer to FSAP, Table FSAP-1 for air sampling frequencies and type

NOTES:

- 1 For metals analysis, no extra sample volume is required; MS/MSD will be performed at a rate of one per twenty investigative samples analyzed by the laboratory.
- 2 RCRA Metals = arsenic, barium, chromium, lead, selenium, silver, and mercury.
- 3 Estimate of one sample to be collected for every 10,000 yards of material per source.
- 4 Field blank samples are only required if re-usable sampling equipment is used (i.e. stainless steel bowls or trowels).
- 5 Assumes analysis of one treatment sample for every 250 cubic yards for the first 1,000 yards and every 500 yards thereafter. Assumes 1,800 to 3,600 cubic yards of material to be treated.
- 6 If actual volume necessitates some off-site disposal as nonhazardous special waste.
- 7 Bulked wastewater not used for dust suppression, will be sampled for NEORS discharge parameters for discharge to city sewer system.
- 8 If the TPH results exceed the petroleum fraction residual saturation concentrations listed in Table 1 under Ohio Rule 3745-300-8 (8 to 40 mg/Kg for glacial till or silty clay soils), the fill will then be analyzed for SVOC compounds.

## 4.0 SAMPLING PROCEDURES

This section summarizes the sample documentation, sampling procedures and the QC sample preparation requirements associated with the RA tasks. A detailed discussion of the sampling procedures is presented in the Field Sampling and Analysis Plan (FSAP), presented in Appendix C of the Final RD/RA Workplan, revision 1.

Details on holding times, sample preservation and bottle requirements are presented in the FSAP, Table FSAP-1. The holding time for pesticides/PCBs listed in Table FSAP-1 reflects the post-extraction holding time of 40 days. However, pesticide and PCB samples also have a pre-extraction holding time requirement of fourteen days

### 4.1 SAMPLE DOCUMENTATION/IDENTIFICATION

The designated sample identification system is discussed in detail in Section 2.2 of the FSAP and summarized below:

Sample Type	Identification System
<b>Air Samples:</b>	
TSP High Volume Samples	TSP-Unit#-001
Personal/Area Low Volume Samples	PAS-Unit#-001
<b>Soil Samples:</b>	
X-Ray Fluorescence Field Screening	X-01-1
Post-Excavation Confirmatory Samples	V-01-2.0'
Treated Material-Confirmation (TCLP) Samples	TS-001
Imported Backfill Samples	BF-001
<b>Waste Characterization Samples:</b>	
Solid Waste (stabilized soils, if needed)	W-001
Wastewater	WW-001
<b>Quality Control Samples:</b>	
Field Duplicate Samples for Soil, and Treated Material	V-01-2.0'D TS-001D
Field Rinsate Blanks	FB-001

Sample identification documents will be carefully prepared to maintain identification and chain-of-custody records, and to control sample disposition. Components of the field documentation procedures include the use of field logbooks, sample labels, and the chain-of-custody forms. Original data recorded

Sample identification documents will be carefully prepared to maintain identification and chain-of-custody records, and to control sample disposition. Components of the field documentation procedures include the use of field logbooks, sample labels, and the chain-of-custody forms. Original data recorded in field logbooks, chain-of-custody records, and other forms will be written in waterproof ink. None of these documents will be altered, destroyed, or discarded, even if they are illegible or contain inaccuracies that require a replacement document. If an error is made on a document assigned to one individual, that individual will make the corrections by making a line through the error, entering the correct information, and initialing and dating the change. Samples and documentation will be maintained and handled by as few people as possible.

## **4.2 SAMPLE COLLECTION/PREPARATION PROCEDURES**

Sample collection methodology is described in detail in Section 3.0 and Section 4.0 (air) of the FSAP and summarized in the following subsections.

### **4.2.1 XRF Field Screening**

The XRF or Lead analyzer will be used on site during excavation activity only as a screening tool to assess the total lead concentration in soils but will not be used to verify that performance standards have been met. The area to be screened will be prepared by scraping the top layer of potentially cross-contaminated soil with a stainless steel trowel or plastic scoop and smoothing the area flat so as not to pierce the Mylar window of the probe. The in-situ measurement will be made by placing the XRF probe on a flat area of the ground surface and scanning the soil surface.

The particular instrument to be used is the Spectrace 9000 Portable XRF Analyzer or comparable Lead Analyzer. This device utilizes a probe, which consists of a sealed aluminum enclosure containing a high-resolution mercuric iodide detector and three radioisotope x-ray excitation sources, Fe-55, Cd-109 and Am-241. The Spectrace 9000 utilizes a fundamental parameter XRF calibration derived from theoretical considerations. The menu-driven software supports multiple XRF calibrations called "Applications". Each Application is a complete analysis configuration including elements to be measured, interfering elements in the sample, and a set of fundamental parameter calibration coefficients.

The Standard Operating Procedure (SOP) for the XRF instrument is included in Attachment FSAP-1 of the FSAP. The XRF field screening data may be tabulated for presentation in the final report, but is not to be used to confirm that the performance standards have been met.

### **4.2.2 Confirmatory Sampling**

If excavation is terminated in a grid prior to reaching the historic slag (maximum depth), a confirmatory sample will need to be collected to verify that the RBRG of 1,000 mg/Kg has been met for that grid. The sample will be collected as a grab sample using the following equipment and supplies:

- Stainless steel or plastic disposable scoops or trowels
- Sample containers and plastic bags
- Field notebook



- Chain-of-custody form
- Decontamination supplies (Decontamination may be conducted at the sample location staging area or the main decontamination area)

Field notes will be recorded for each sample taken and will include sample identification, soil description (color, type, and foreign material) and any other pertinent observations relating to the sample or site conditions at the time of sampling.

The sample will be obtained by excavating soil from a depth of approximately 0 to 3 inches below excavated ground surface using either a decontaminated stainless steel trowel or a clean plastic disposable scoop. An additional quantity of sample material will be obtained at 10 percent of the sample locations for a field duplicate and will be shipped to the laboratory. The sample material will be stirred in a Ziploc plastic bag or stainless steel bowl to homogenize, then split in half to make each sample portion. Replicate/split samples will be also be provided to the EPA upon request.

#### **4.2.3 Backfill Characterization Sampling**

Backfill samples will be collected as single grab samples from the representative material for each source and for each type of material prior to shipment to the site to ensure the material meets both the chemical and geotechnical requirements and then at increments of one sample per 10,000 tons. A change in source location will require the collection of a new initial sample round for each type and source used. No field duplicates, field blanks or MS/MSD samples will be collected for the backfill samples.

The samples will be submitted to the designated Project Laboratory, GeoAnalytical, Inc., Twinsburg, Ohio, for chemical analysis of the applicable parameters using DQO Screening Level in accordance with the QAPP. DQO Screening Level 2-3 will provides the appropriate level of quality assurance data for fill material characterization. Samples will also be submitted either to the selected geotechnical testing laboratory or will be tested by the source supplier with certification provided to ENTACT for review and approval.

#### **4.2.4 Waste Characterization Sampling**

Waste characterization samples will be collected as grab samples from representative material for the parameters listed in Table 1. The frequency of collection is dependent on landfill requirements as well on the RCRA classification of the material. Waste characterization sampling will follow the procedures outlined in the FSAP, Section 5.2.23.3. No field duplicates, field blanks or MS/MSD samples will be collected for the waste samples.

The samples will be submitted to the designated Project Laboratory, Geo-Analytical, Twinsburg, Ohio, for off-site laboratory analysis of the applicable parameters using DQO Screening Level in accordance with the QAPP. DQO Screening Level typically provides the appropriate level of quality assurance data for waste characterization.

#### **4.2.5 Air Sampling**

Two types of air samples will be collected at this site. TSP samples will be collected to determine the total quantity of dust in the air that can be entrained in the respiratory system and the amount of lead particles in the air. Personal / area air samples will be collected in order to monitor worker safety conditions as specified in the HASP. The units will be calibrated in accordance with the manufacturer recommendations.

Personal / area air samples will be obtained for personnel and areas by using battery powered Gilian HFS 513 Hi Flow Samplers or equivalent with 37 mm mixed cellulose ester filters. Personal air samples will be taken from the breathing zone of the workers. On-site area samples will be taken in areas where one could reasonably expect elevated airborne lead levels to occur during work activities. Each pump will be calibrated before and after each use using a primary standard (rising soap film). If a variation is found in the flow rate established during the pre and post sampling calibration, the lower, more conservative flow rate will be used and all volume calculations will be based upon the lower flow rate. The flow rate of all pumps will be between 2.0 and 4.0 liters per minute.

One lot blank will be provided to the laboratory per box of filters. No additional QC samples are required for air sampling.

The Standard Operating Procedures for the Total Suspended Particulate (TSP) matter, and Personal / Area Air samplers are provided in Attachments FSAP-2, and FSAP-3 of the Field Sampling and Analysis Plan.

#### **4.3 FIELD QC PROCEDURES**

Field duplicate will be collected for confirmatory soil samples and treatment verification samples at a rate of one duplicate for every ten investigative samples collected. At the designated sample location where a duplicate sample will be collected, an ample volume of material will be placed in a Ziploc plastic bag or stainless steel bowl and thoroughly homogenized prior to filling the sample jars. The field duplicate sample will be blind labeled as FD-001 and continue sequentially from 001 with the associated investigative sample recorded in the logbook.

If reusable-sampling equipment is used, (i.e. stainless steel bowl and/or trowel), a field blank sample will be prepared at a rate of one rinsate sample for every 10 investigative samples taken by pouring distilled water over the decontaminated sampling equipment.

MS/MSD samples will be performed at a rate of one for every 20 investigative samples analyzed by the laboratory. No extra sample volume is required for the MS/MSD samples for metals. The MS/MSD will be performed at a rate of one per twenty investigative samples.

#### **4.4 SAMPLE CONTAINERS, PRESERVATIVES AND VOLUME REQUIREMENTS**

Confirmatory soil samples and treatment verification samples will be placed into clean plastic or glass 2- and 4-ounce containers for soil samples and 8-ounce containers for TCLP lead analysis. Sample jars will

be supplied by a vendor or laboratory and will be certified clean. There are no preservatives required for either analyses and the container should be completely filled. The container will be labeled with the sample identification number, date and time of sampling and the initials of the sampler. The sample container will be placed in a sealed plastic bag for transportation to the laboratory. The designated laboratory will provide a daily courier service during remedial activities to allow for an expedited analytical turn-around time. If samples must be transported by means of commercial transportation, the samples will be placed in a cooler, packaged in a manner to prevent shifting and breakage in transit, and a custody seal will be placed on the cooler housing the samples such that any tampering with the cooler will be evident by the seal. No ice is required for metal parameters. Sample labels and custody seals are presented in Attachment QAPP-D.

Backfill or waste profile samples that include multiple parameters will be placed into the appropriate container specified in Table FSAP-1 of the FSAP. The volatile organic compound sample will be collected first and placed directly into the sample container to minimize any loss of volatile compounds, with no mixing or homogenizing the soils to prevent loss of potential volatiles contaminants

Sample containers and preservatives are not required for the XRF screening samples. If it is impractical to obtain an in-situ sample, then clean ziplock bags can be used as sample containers. These bags will be labeled to identify the sample identification code, date, time, and sampler's initials.

Air sample filters will be supplied by the laboratory. The sample filters will not be open, left out or tampered with prior to sampling. There are no preservatives required for lead or PM10 analysis.

#### 4.5 SAMPLE CUSTODY

A Chain-of-Custody (COC) form will be filled out at the time of sampling. Information to be recorded on the COC includes sample identification, sample description, name(s) of sampler(s), and requested analyses. The COC will be placed in a sealed plastic bag for protection and will accompany the associated samples to the laboratory. Any time the sample custodian changes, the person relinquishing the samples shall sign the COC and note the date and time of transfer. The person receiving the samples shall also sign the COC and note the date and time of transfer. Attachment QAPP-D of the QAPP includes examples of COC forms for GeoAnalytical and Pace Analytical. An example GeoAnalytical COC is located in Attachment QAPP-D of the QAPP.

#### 4.6 DECONTAMINATION PROCEDURES

All re-usable sampling equipment will be decontaminated utilizing a triple rinse procedure. During this procedure, the sampling equipment is scrubbed in a potable water/detergent wash (gross rinse), rinsed in potable water (intermediate rinse), and rinsed with distilled water (final rinse). All three decontamination fluids are changed as needed to ensure proper decontamination; however, to conserve the quantity of waste generated, ENTACT will downgrade the three phase fluids. For example, the final phase fluids are downgraded to intermediate fluids, intermediate fluids are downgraded to gross fluids, gross fluids are collected in a DOT approved container, and fresh distilled water is placed in the final phase. This method minimizes waste and ensures that the final phase fluids are clean. Spent decontamination fluids will be collected throughout the project for proper disposal at an authorized treatment facility.

After decontamination, the sampling equipment will be dried with disposable towels and stored in plastic sampling tool boxes between sampling events. All decontaminated equipment within the sampling tool box will be placed in individual plastic bags or wrapped in disposable towels. The sampling tool boxes will also be decontaminated weekly to ensure cleanliness. All trash and PPE generated during sampling will be placed in designated disposal containers for such items.

#### **4.7 SAMPLE PACKAGING AND SHIPMENT PROCEDURES**

Sample containers will be laboratory prepared and shipped in sealed containers to assure that they remain clean. Sample containers will be selected to ensure compatibility with the media being collected, preserve sample integrity, and minimize breakage during transportation. Sample labels will be filled out at the time of sampling and will be affixed to each container to identify sample number, sampler's name, date and time of collection, location of sampling point, and project identification data.

After the containers for a given sampling location have been filled out, they will be placed in plastic Ziplock storage bags, on ice (for VOC, SOC and pesticide/PCB samples only), in an insulated cooler, to be delivered to the analytical laboratory. Each sample container will be secured in packing material, as appropriate, for shipment to the designated laboratory. The insulated cooler lid will be taped closed and sealed to avoid the entrance of contaminants into the cooler and to avoid leaking from the cooler. Shipment of samples to the laboratory will take place on the same day as collection. The Chain-of-Custody form will be enclosed in a sealed plastic bag and adhered inside the sealed cooler. If the samples are sent by common carrier, a bill of lading will be used to document the custody of the sample while in transit. Commercial carriers are not required to sign the COC forms as long as the forms are sealed inside the cooler.

## **5.0 CUSTODY PROCEDURES**

Custody is one of several factors which is necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files. Final evidence files, including all original laboratory reports, are maintained under document control in a secure area.

A sample or evidence file is under one's custody if:

- the item is in actual possession of a person; or
- the item is in the view of the person after being in actual possession of the person; or
- the item was in actual physical possession but is locked up to prevent tampering; or
- the item is in a designated and identified secure area.

### **5.1 FIELD CUSTODY PROCEDURES**

Sample identification documents will be carefully prepared to maintain identification and chain-of-custody records and to control sample disposition. Components of the field documentation procedures include the use of field logbooks, sample labels, and the chain-of-custody forms. Original data recorded in field logbooks, chain-of-custody records, and other forms will be written in waterproof ink. The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched.

#### **5.1.1 Field Logbook Records**

A field log of daily activities will be used to record sampling activities on a daily basis. This book will be bound and have consecutively numbered pages. Entries in the field logbook will be made in ink and will include: the name of the author; date and time of entry; location of activity; names and affiliations of personnel on site; sample collection or measurement methods; number of samples collected; daily weather report; sample identification numbers; field observation and comments; sampling depth increment for soils; field measurements; locations of photographs; and any deviations from the sampling plan. Each logbook will be assigned a project specific document number. The field log book will be stored in the job trailer when it is not in use.

#### **5.1.2 Sample Labels**

Sample labels are necessary to prevent misidentification of samples. Preprinted labels will be provided prior to the sampling activities. Each label will contain space for the following information: name of site, sample identification, date and time of sample collection, media sampled, name of sampler, preservatives, and types of analyses to be performed. Example of custody seal and label is provided in Attachment QAPP-D of the QAPP.

### 5.1.3 Chain-of-Custody Records

A Chain-of-Custody (COC) form will be completed to record the custody of every sample collected. A COC form will accompany every shipment of samples to the analytical laboratory in order to establish the documentation necessary to trace sample possession from the time of sample collection through sample analysis.

The sample portion of the COC form will include the following:

- Project number, name and location;
- Sample identification;
- Name of Project Manager, Sampler, and Recorder;
- Sampling information (sampling area, depth, media type, type of sample, date and time of collection, etc.);
- Analysis to be performed;
- Preservatives used, if any; and
- Signatures of persons involved in the COC possession, including dates.

When a Chain-of-Custody form is filled out, one page of the three-part form is retained and placed in a file at the on-site office. The other two parts of the form accompany the sample to the laboratory. One of those pages is retained by the laboratory and the other is returned with the sample result report. When the sample report is received, it is cross-checked with the COC file record and both COC pages and the laboratory report are placed in a file in fireproof storage at the on-site office. The analytical result is also entered into a computer database consisting of a comprehensive list of all samples taken at the site and the analytical results.

## 5.2 LABORATORY CUSTODY PROCEDURES

Samples, which are delivered by clients or received by courier, are placed in a secure Sample Control Area immediately upon delivery. Coolers containing samples are unpacked within ½ hour of receipt or placed in the walk-in cooler until unpacked. The COC accompanying the samples will be signed by the Sample Custodian or their designee at the time of delivery by the client, or in the case of courier delivery, where the COC is sealed up inside of the cooler, at the time of unpacking.

At the time of arrival and/or unpacking, coolers will be inspected for evidence of damage. They will be unpacked carefully and samples will be organized on the lab bench in numerical order or by sample sets and assigned a laboratory job number. The condition of both shipping containers and sample containers will be recorded on the internal COC form.

Information on the COC shipped with samples will be verified and recorded as to agreement or non-agreement. Labels will be checked for notation of proper preservation. If there is an apparent non-agreement in the document or incorrect preservation noted, the apparent problem will be recorded and the ENTACT Project Manager notified. The samples will then be marked or labeled with laboratory sample numbers. Laboratory project numbers are assigned serially, with each sample numbered as a subset of the project number. Finally, samples will be placed in appropriate storage and/or secure areas.

### 5.3 FINAL EVIDENCE FILES

The final evidence file will be the central repository for all documents, which constitute evidence relevant to sampling and analysis activities as described in this QAPP. ENTACT is the custodian of the evidence file and maintains the contents of the evidence files for the MMI removal action, including all relevant reports, records, logs, field notes, pictures, and data reviews in a secured, limited access area under the custody of the ENTACT Project Manager.

## 6.0 CALIBRATION PROCEDURES AND FREQUENCY

Procedures described in this section pertain to the calibration, maintenance, and operation of equipment and instrumentation to be used during the implementation of the remedial action. A variety of instruments, equipment, and sampling tools will be used to collect data and samples to monitor site conditions. Proper calibration, maintenance, and use of instruments and equipment ~~are~~is imperative to ensure the quality of all data collected. A record of calibration and maintenance activities is important to provide legally dependable data.

Instruments and equipment used to gather, generate or measure environmental and physical testing data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility are consistent with the manufacturer's specifications.

### 6.1 FIELD INSTRUMENT CALIBRATION

All instruments and equipment purchased or used for the MMI removal action will be inspected to ensure that the item meets and performs to manufacturer's specifications and project specifications. Instruments meeting these requirements are issued to a field technician trained in instrument operation and made available for site use. All field equipment will be calibrated in accordance with the specific field SOPs located in ~~Attachment QAPP-C of the QAPP and~~ in Attachments FSAP-A, FSAP-B, and FSAP-C of the Field Sampling and Analysis Plan. All air samplers will be calibrated in accordance with manufacturer recommendations.

The XRF will be calibrated with the manufacturer's standards and three site-specific standards. Each standard and sample reading will be taken in triplicate and averaged. To check the initial calibration, the middle calibration standard will be rechecked after every twenty samples. A record of the instrument calibration will be maintained in a bound field notebook and these records will be subject to a QA audit. Information recorded will include the following:

- Date of calibration
- All data pertaining to the calibration procedures
- Initials of analyst performing calibration
- Adjustments made to equipment prior to and following calibration; and
- Record of equipment failure

Field instruments that will be used during this project include an X-Ray Fluorescence Analyzer, or comparable Lead Analyzer, TSP and personal/area air samplers.

Any items found to be inoperable will be taken out of use and a note stating the time and date of this action will be made in the calibration logs. The reason for equipment failure and the time and date of its return to service will also be noted in the logbook. Records produced shall be reviewed, maintained, and filed by the field operators. The ENTACT Project Manager will audit these records to verify complete adherence to these procedures.



## **6.2 LABORATORY INSTRUMENT CALIBRATION**

All laboratory instrument calibration procedures can be found in the attached SOPs (Attachment QAPP-B).

## 7.0 ANALYTICAL AND MEASUREMENT PROCEDURES

The laboratory that will be performing all sample analysis for this project, except for air samples, is:

GeoAnalytical Inc.  
9263 Ravenna Road  
Twinsburg, Ohio  
Phone: (330) 963-6990

Laboratory accreditations and certifications are presented in Attachment QAPP-E.

The laboratory that will be performing air analyses for this project is:

Pace Analytical Services, Inc.  
7726 Moller Road  
Indianapolis, IN 46268  
Phone: (317) 875-5894

Complete list of analytical parameters, methods, matrices, holding times and preservation requirements are included in the FSAP, Table FSAP-1.

### 7.1 FIELD ANALYTICAL PROCEDURES

Field analytical and test procedures include the following:

#### Soil

XRF - Total Lead

The SOP for this device is located in Attachment FSAP-A of the Field Sampling and Analysis Plan, Appendix C of the RD/RA Workplan.

#### Air

TSP Air Monitor  
Area/Personal Air Monitors

The SOP for these monitors are located in Attachment FSAP-B and FSAP-C of the Field Sampling and Analysis Plan, Appendix C of the RD/RA Workplan.

### 7.2 LABORATORY ANALYTICAL PROCEDURES

Laboratory analytical test procedures include the following:

#### Soil:

Total Lead - Method 6010/6020

Treated Soils:

TCLP lead - Method 1311/6010

Off-Site Backfill Source:

Total RCRA Metals – Method 6010/6020/7471

TPH - Method 8015 (SVOC analysis (Method 8270C) may be required depending on TPH levels)

VOCs – Method 8260

Pesticides/PCBs – Method 8081

Air Monitors:

Total lead and particulate matter less than 10 $\mu$ m (PM<sub>10</sub>) – Method 7082/7105/7300/Appendix G of 40 CFR 50

The air analytical results will be provided by Pace Analytical Services, Inc. of Indianapolis, IN . The SOPs for the air monitoring are provided in Attachments FSAP-B and FSAP-C of the Field Sampling and Analysis Plan. Pace Analytical's SOPs for sample handling are provided in Attachment QAPP-A.

All SW-846 methods will be used for analysis. Analytical methods and extraction methods for soil, air and backfill are provided in the FSAP, Table FSAP-1.

### **7.3 LIST OF TARGET COMPOUNDS AND LABORATORY REPORTING LIMITS**

The reporting limits are given in Table QAPP-3 through QAPP-7 for the analyses required during the RA. The instrument detection limit is determined once per quarter and is confirmed to be less than the reporting limit. Current instrument and method detection limits are presented in the applicable SOP in Attachments QAPP-B1 through QAPP-B16.

**TABLE QAPP-3**  
**Total Metals**  
**Method 6020/7471A Soil Limits**

<b>Metal</b>	<b>Matrix</b>	<b>Method</b>	<b>Reporting Limit (mg/Kg)</b>
Arsenic (ICAP)	Soil	SW-6020	5.0
Barium (ICAP)	Soil	SW-6020	5.0
Cadmium (ICAP)	Soil	SW-6020	1.0
Chromium (ICAP)	Soil	SW-6020	2.0
Mercury (CVAA)	Soil	SW-7471A	0.10
Selenium (ICAP)	Soil	SW-6020	5.0
Silver (ICAP)	Soil	SW-6020	1.0
Lead (ICAP)	Soil	SW-6020	1.0

**TABLE QAPP-4**  
**Volatile Organic Compounds**  
**Method 8260 Soil Limits**

Compound	Method Reporting Limit (µg/kg)
Dichlorodifluoromethane	5
Chloromethane	5
Vinyl chloride	5
Bromomethane	5
Chloroethane	5
Trichlorofluoromethane	5
1,1-Dichloroethene	5
Trans-1,2-Dichloroethene	5
Methyl-tert-butyl ether	5
1,1-Dichloroethane	5
2,2-Dichloropropane	5
cis-1,2-Dichloroethene	5

**TABLE QAPP-4 continued**  
**Volatile Organic Compounds**  
**Method 8260 Soil Limits**

Compound	Method Reporting Limit (µg/kg)
Bromochloromethane	5
Chloroform	5
1,1,1-Trichloroethane	5
Carbon Tetrachloride	5
1,1-Dichloropropene	5
Benzene	5
1,2-Dichloroethane	5
Trichloroethene	5
1,2-Dichloropropane	5
Dibromomethane	5
Bromodichloromethane	5
cis-1,3-Dichloropropene	5
Toluene	5
Trans-1,3-Dichloropropene	5
1,1,2-Trichloroethane	5
1,3-Dichloropropane	5

**TABLE QAPP-4 continued**  
**Volatile Organic Compounds**  
**Method 8260 Soil Limits**

Compound	Method Reporting Limit (µg/kg)
Tetrachloroethene	5
Dibromochloromethane	5
1,2-Dibromomethane	5
Chlorobenzene	5
1,1,1,2-Tetrachloroethane	5
Ethylbenzene	5
Total Xylenes	5
Styrene	5
Bromoform	5
Isopropylbenzene	5
Bromobenzene	5
1,1,2,2-Tetrachloroethane	5
1,2,3-Trichloropropane	5
n-Propylbenzene	5
2-Chlorotoluene	5
4-Chlorotoluene	5
1,3,5-Trimethylbenzene	5

**TABLE QAPP-4 continued**  
**Volatile Organic Compounds**  
**Method 8260 Soil Limits**

Compound	Method Reporting Limit (µg/kg)
tert-Butylbenzene	5
1,2,4-Trimethylbenzene	5
sec-Butylbenzene	5
1,3-Dichlorobenzene	5
p-Isopropyltoluene	5
1,4-Dichlorobenzene	5
1,2-Dichlorobenzene	5
n-Butylbenzene	5
1,2-Dibromo-3-chloropropane	5
1,2,4-Trichlorobenzene	5
Hexachlorobutadiene	5
Naphthalene	5
1,2,3-Trichlorobenzene	5
Acetone	25
2-Butanone	25
Carbon Disulfide	5
2-Hexanone	25
4-Methyl-2-pentanone	25



**TABLE QAPP-5**  
**Total Petroleum Hydrocarbons (TPH)**  
**Method 8015**

Compound	Matrix	Method Reporting Limit (mg/Kg)
TPH [see note]	Soil	4

*Note: Backfill material will be sampled for TPH. If TPH levels exceed the petroleum fraction residual saturation concentrations listed in Table I under Ohio Rule 3745-300-8 (8 to 40 mg/Kg for glacial till to silty clay soils) the fill material will then be sampled for semi-volatile organic compounds as listed below.*

**TABLE QAPP-6**  
**Semi-Volatile Organic Compounds (SVOCs)**  
**Method 8270**

Parameter	Method Reporting Limit (µg/Kg)
Acenaphthene	330
Acenaphthylene	330
Anthracene	330
Benzo(a)anthracene	330
Benzo(b)fluoranthene	330
Benzo(k)fluoranthene	330
Benzo(a)pyrene	330
Benzo(g,h,i)perylene	330
Benzyl alcohol	330
Bis(2-ethylhexyl)phthalate	330
Chrysene	330
Dibenzo(a,h,i)anthracene	330
Dibenzofuran	330
Di-n-butylphthalate	330

**TABLE QAPP-6 continued**  
**Semi-Volatile Organic Compounds (SVOCs)**  
**Method 8270**

Parameter	Method Reporting Limit (µg/Kg)
1,2-dichlorobenzene	330
1,4-dichlorobenzene	330
2,4-dichlorophenol	330
2,4-dimethylphenol	330
2,4-dinitrotoluene	330
2,6-dinitrotoluene	330
Di-n-octylphthalate	330
Fluoranthene	330
Fluorene	330
Hexachlorobenzene	330
Hexachlorobutadiene	330
Hexachlorocyclopentadiene	330
Hexachloroethane	330
Indeno(1,2,3-cd)pyrene	330
Isophorone	330
2-Methylnaphthalene	330
2-Methylphenol	330
4-Methylphenol	330
Naphthalene	330
2-Nitroaniline	330
4-Nitroaniline	330
Nitrobenzene	330
2-Nitrophenol	330

**TABLE QAPP-6 continued**  
**Semi-Volatile Organic Compounds (SVOCs)**  
**Method 8270**

Parameter	Method Reporting Limit (µg/Kg)
4-Nitrophenol	330
Pentachlorophenol	330
Phenanthrene	330
Phenol	330
Pyrene	330
Carbazole	330
1,2,4-Trichlorobenzene	330
2,4,6-Trichlorophenol	330
2,4-Dinitrophenol	1650
Diethylphthalate	330
4-Chlorophenyl-phenyl ether	330
4,6-Dinitro-2-methylphenol	330
4-Bromophenyl-phenyl ether	330
Butylbenzylphthalate	330
3,3-Dichlorobenzidine	1650
bis(2-Chloroethyl) ether	330
2-Chlorophenol	330
1,3-Dichlorobenzene	330
N-Nitrosodipropylamine	1650
bis(2-Chloroethoxy)methane	330
4-Chloroaniline	330
4-Chloro-3-methylphenol	330
2,4,5-Trichlorophenol	330

**TABLE QAPP-6 continued**  
**Semi-Volatile Organic Compounds (SVOCs)**  
**Method 8270**

Parameter	Method Reporting Limit (µg/Kg)
2-Chloronaphthalene	330
2-Methyl-4,6-dinitrophenol	1650
Dimethyl phthalate	330
3-Nitroaniline	330

**TABLE QAPP-7**  
**Pesticides/PCBs**  
**Method 8081 Soil Limits**

Compound	Method Reporting Limit (µg/Kg)
Aldrin	0.05
Alpha-BHC	0.05
Beta-BHC	0.05
Delta-BHC	0.05
Chlordane	85
4,4'-DDD	3.3
4,4'-DDE	3.3
4,4'-DDT	3.3
Dieldrin	3.3
Endosulfan I	1.7
Endosulfan II	3.3
Endosulfan Sulfate	3.3
Endrin	3.3
Endrin Aldehyde	3.3
Heptachlor	1.7
Heptachlor epoxide	1.7
Lindane	1.7
Methoxychlor	17
Toxaphene	85
Aroclor 1016	33
Aroclor 1221	33
Aroclor 1232	33
Aroclor 1242	33
Aroclor 1248	33
Aroclor 1254	33
Aroclor 1260	33

## 8.0 QUALITY CONTROL CHECKS

Internal QC procedures are designed to ensure and document the overall quality of data. Two types of QC checks will be employed to evaluate the performance of the laboratory's analytical procedures. The QC checks represent the system checks and controlled samples introduced into the sample analysis stream that are used to validate the data and calculate the accuracy and precision of the chemical analysis program.

Project QC checks are accomplished by submitting controlled samples into the laboratory from the field. Two external types of QC samples will be used: blanks and duplicates. A duplicate sample will be collected for every 10 samples per matrix or one duplicate per day, whichever is greater. Any samples submitted as "blind" samples will be noted in the field logbook and given a sample number that does not indicate to the laboratory that the sample is a QC check.

### 8.1 FIELD QUALITY CONTROL CHECKS

For field XRF soil analyses, a laboratory sample will be sent to the laboratory for confirmatory total lead analysis for ten percent of the investigatory samples. Table QAPP-8 presents the QA criteria for field measurements.

### 8.2 LABORATORY QUALITY CONTROL CHECKS

Laboratory QC checks are accomplished through the use of system checks and QA/QC samples that are introduced into the same analysis stream. Laboratory system checks and QA/QC samples for inorganics are defined below.

- Calibration Blank - A volume of acidified de-ionized water.
- Continuing Calibration - Analytical standard run every 10 analytical samples or every two hours, whichever is more frequent, to verify the calibration of the analytical system.
- Instrument Calibration - Analysis of analytical standards for a series of different specified concentrations used to define the quantitative response, linearity, and dynamic range of the instrument to target compounds.
- Preparation Blank - An analytical control that contains deionized water and reagents, carried through the entire analytical procedures. An aqueous method blank is treated with the same reagents as a sample with a water matrix; a solid-method blank is treated with the same reagents as a soil sample.

Laboratory QA/QC checks will be performed and samples will be analyzed at a frequency established by appropriate SW-846 protocols for inorganic compounds and appropriate SOPs for analytical methods. Attachment QAPP-C defines all the GeoAnalytical, Inc. QC check criteria for this project. Any QC checks that do not meet acceptance criteria will be handled as discussed in Section 13.0 of the QAPP.

**Table QAPP-8  
 FIELD QC CRITERIA**

PARAMETER	METHOD <sup>(1)</sup> REFERENCE	PRECISION <sup>(2)</sup>	ACCURACY <sup>(2)</sup>	COMPLETENESS
SOIL				
Field XRF	Per ENTACT SOP	<u>+ 20%</u>	N/A <sup>(3)</sup>	90%

**NOTES:**

1. Methods: E - *Method for Chemical Analysis for Water and Wastes* (U.S. EPA, 1983).  
 SW-xxxx - *Methods for the Analysis of Solid Waste (SW-846)*.
2. Acceptable accuracy and precision based on the range of measurement. The XRF will be used for screening purposes only and to guide depths of excavation during remedial activities. Laboratory confirmation samples will be the determining factor as to whether cleanup criteria is achieved.
3. NA - Not Applicable



## 9.0 DATA REDUCTION, VALIDATION AND REPORTING

All data collected will be managed, distributed, and preserved to substantiate and document that data are of known quality and are properly maintained. Technical data will be tracked and validated to monitor the performance of the tasks. An outline of the QC data handling process for data collection, transfer, validation, reduction, reporting, and storage for both field and laboratory QC data is described below. The ENTACT QA Manager is responsible for these tasks.

### 9.1 DATA REDUCTION

Data quality and utility depends on many factors, including sampling methods, sampling preparation, analytical methods, quality control, and documentation. Once all physical and chemical data are validated and assembled, these data are further evaluated with respect to precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters. Satisfaction of these criteria will be documented as listed below. Chemical data must meet criteria of (1) quantitative statistical significance, (2) custody and document control, and (3) sample representativeness. Physical data must meet criteria of: (1) sampling location, time, and personnel; (2) documentation; and (3) methodologies.

To determine the quantitative statistical significance of chemical data, the following items will be documented as appropriate:

- Laboratory/field instrumentation, including calibration data, standard methods, and references;
- Proper sample bottle preparation;
- Laboratory analysis detection limits;
- Analysis of laboratory (reagent) blanks at a frequency of at least one per 20 samples per matrix;
- Analysis of laboratory spikes at a frequency of at least 1 per 20 samples or one per analytical batch;
- Analysis of field replicates (duplicates or splits) at a frequency of at least 1 per 10 samples for each matrix or one per day, whichever is greater;
- Analysis of laboratory replicates (duplicates or splits) at a frequency of at least 1 per 20 samples;
- Presentation of tabulated QC data; and
- QA/QC certification of the laboratory is semi-annually through the Ohio EPA Voluntary Action Program and annually through the Ohio Drinking Water program for VOCs only.

To evaluate the custody and document control for samples and results, the following items will be documented:

- Field custody noted in field logbook or chain-of-custody documentation available;
- Samples either couriered or hand-delivered to laboratory with chain-of-custody documentation available;
- Laboratory custody documented by chain-of-custody documentation from either field personnel or shipper;
- Laboratory custody documented through designated laboratory sample custodian with secured sample storage area;
- Sample designation number(s) traceable through entire laboratory monitoring system;
- Field notebooks and all custody documents stored in secure repository or under the control of a document custodian;
- All forms filled out completely in indelible ink without alterations except as initials;
- Identity of sampler; and
- Date of sample collection, shipping, and laboratory analysis.

To determine sample representativeness the following items must be checked:

- Compatibility between appropriate field and laboratory measurements or suitable explanation of discrepancy;

- Analysis within holding time limits suitable for the preservation and analysis methods used;
- Sample storage within suitable temperature, light, and moisture conditions;
- Proper sample containers used;
- Proper sample collection equipment used and properly decontaminated;
- Proper sample preservation;
- Proper laboratory preparation techniques used;
- An evaluation of factors to determine bias screening; and
- Sample site selection criteria to provide representativeness.

To evaluate the field physical data that support the analytical data, the following items will be documented:

- Sampling date and time;
- Sampling personnel;
- Sampling location;
- Physical description of sampling location;
- Sample collection technique;
- Field preparation techniques;
- Visual classification of sample using an accepted classification system;
- A thorough description of the methodology used and a rationale for the use of that methodology;
- Complete documentation of record-keeping practices;
- Field notebook and all custody documents stored in a secure repository or under the control of a document custodian; and
- All forms filled out in indelible ink without alterations except as initialed.

#### **9.1.1 Field Data Reduction Procedures**

Field data reduction is not anticipated for this project. The data will be generated from direct readout instruments. The data is then downloaded by RS-232 computer port to a database spreadsheet. The field XRF values will be entered into the field logbook so data transcription errors can be discerned easily upon validation. Temperature, pH, specific conductance and turbidity measurements will be transcribed directly from direct read instruments. The information will be entered into the field logbook and checked for transcription errors by the sampling team.

### **9.1.2 Laboratory Data Reduction Procedures**

Reduction procedures in the laboratory will be performed by computer database that will provide printouts of raw data and chromatograms. The information will be evaluated by the bench analyst to ensure proper integration and assignment of various sample constituents. Lab records will note all other information not processed by computer such as reagents, sample preparations, etc.

The department supervisor will review the lab notebook and associated computer printouts to ensure all information is accurate and no errors have occurred. Prior to laboratory release of the data, QA/QC will be performed to assess precision and accuracy requirements of the data have been met.

## **9.2 DATA VALIDATION**

Technical data, including field data and results of laboratory sample analyses, will be validated to monitor the performance of the remedial action. The data collection and quality assurance procedures for validating field and laboratory data are described below.

Field precision is assessed through the collection and measurement of field duplicates at a rate of 1 duplicate per 10 investigative analytical samples.

### **9.2.1 Procedures Used to Validate Field Data**

Validation of data obtained from field measurements will be performed by the ENTACT QA Manager. Such validation will be performed by regularly checking procedures utilized in the field and comparing the data to previous measurements. Data that cannot be validated will also be documented.

Field data requiring validation includes the raw data and supportive documentation generated from field investigations and will include, but is not limited to, the following:

- Field notebooks
- Field investigation daily reports
- Field instrument readings and calibration data sheet;
- Field log borings;
- Sample labels;
- Chain-of-custody forms;
- Sample tracking records;
- Surveying information; and
- Maps.

Field measurements that could affect the quality of the data (such as temperature, pH, conductivity, and water level) will also be validated. Validation of all field data will be performed in terms of meeting DQOs by checking the procedures utilized in the field and comparing the data to previous measurements. The following areas will be addressed during validation:

- Sampling methodology;
- Sample holding times and preservation;
- Field instrument selection and use;
- Field instrument calibration and standardization;
- Field instrument preventative and remedial maintenance;

- Field deviations; and
- Units of measure and reference points from which field data will be measured.

Additional specific evaluations of data critical to the integrity of the decision making process for this task will be performed on 10 percent of the data and will include:

- Chain-of-custody integrity check;
- Review of the appropriateness of field methodologies;
- Transcription, calculation, completeness, and accuracy check of field data; and
- Analysis of field notes to determine presence of bias.

If substantial errors are detected which impact data quality, the scope of the validation will be increased to determine the extent of the problems.

### **9.2.2 Procedures Used to Validate Lab Data**

Under the direction of the Laboratory QA Manager, lab data will be reviewed to ensure that results for samples meet all method-specified criteria. The requirements to be checked in validation are:

- Sample Holding Times
- Calibration
- Blanks
- Matrix Spike/Matrix Spike Duplicate
- Field Duplicate
- Target Compound Identification
- Spectral Interference Check Sample Analysis
- Compound Quantitation and Reported Detection Limits
- System Performance
- Overall Assessment of Data
- Interference Check Sample Analysis
- Laboratory Control Sample Analysis

One equipment blank will be prepared and documented for every 10 investigative samples to assess the accuracy of sampling techniques. One matrix spike and matrix spike duplicate will be analyzed for every 20 investigative samples.

The laboratory QA Manager will be responsible for assessing data quality and advising appropriate laboratory section supervisors of any data that are "unacceptable" or have notations that would caution the data user to possible unreliability. Data reduction, validation, and reporting by the laboratory will be conducted as follows:

- Raw data produced by the analyst will be turned over to the respective supervisor.
- The supervisor will review the data for attainment of QC criteria as outlined in method protocols and established U.S. EPA methods.
- Upon completion of analytical testing, the laboratory project manager conducts a final review.
- Upon acceptance of the data by the laboratory project manager, a computerized report will be generated and sent to the ENTACT QA Manager.
- The ENTACT QA Manager will complete a thorough audit of all reports.

The ENTACT QA Manager will conduct an evaluation of data reduction and reporting by the laboratory. These evaluations will consider the finished data sheets, calculation sheets, document control forms, blank data, duplicate

data, and recovery data for matrix and surrogate spikes. The material will be checked for legibility, completeness, and the presence of necessary dates, initials, and signatures. The results of these checks will be assessed and reported, noting any discrepancies and their effect upon acceptability of the data. In addition, the QA Manager will check for data consistency by assessing comparability of duplicate analyses, comparability to previous criteria, transmittal errors, and anomalously high or low parameter values. The results of these checks will be reported in writing.

The following is a description of the validation steps that will be used by the ENTACT QA Manager to validate the laboratory data. These validation results will be summarized in the Final Report. The validation steps are as follows:

- Compile a list of all samples
- Compile a list of all QC samples
- Review laboratory analytical procedures and instrument performance criteria
- Specific evaluations critical to the integrity of the data include:
  - Review of chain-of-custody documents for completeness and correctness;
  - Transcription, calculation, completeness, and accuracy check; and
  - Review of laboratory analytical procedures, appropriateness, and instrument performance criteria.

In addition, data validation will be performed on 10 % of the confirmational soil and treatment verification data, as consistent with approved U.S. EPA protocol at previous Superfund projects conducted by ENTACT in Ohio. If significant errors that affect data quality are detected, the percentage of raw data validated will be increased to assess the magnitude of the problem.

- A data summary will be prepared and will include:
  - Results;
  - Sample media identification
  - Sample location and description;
  - Appropriate concentration units;
  - Appropriate significant figures;
  - Data qualifiers; and
  - Definitions
- The laboratory data summary will be reviewed for potential data quality problems, including:
  - Unexpected results;
  - Common laboratory contaminants;
  - Samples in which dilution was necessary;
  - Time and date of sample collection.

A sample data summary will be prepared to assess precision, accuracy, and completeness of the analytical data. Laboratory records and data package requirements will be checked to assess completeness of the data package. The validation effort will be done by personnel qualified and experienced in the field of laboratory data validation.

Despite all efforts to achieve the objectives of the project, the potential for error exists in laboratory chemical analyses and in the data reporting process. Every reasonable effort will be made to compare and double-check data reported from the laboratory with data entered into the data base management system.

### 9.3 DATA REPORTING

Data generated during the MMI removal activities will be appropriately identified, validated, and summarized in monthly progress reports, and included in the final report. The ENTACT QA Manager will develop a data storage and information system to facilitate and manipulate data for tracking, data calculations, and transfer of data to various forms and reports and transmittal of data into a data storage system. Data packages from the laboratory will be in the form of a Level 3 QC package excluding a sample traffic report and electronic deliverables.

Data reporting to the ENTACT QA Manager will be performed by the ENTACT QA Technician and the Field Coordinator. After data validation and reduction, the ENTACT QA Technician will report data to the ENTACT QA Manager. The ENTACT QA Manager will summarize the data obtained and include the information in the field activity report submitted to the Project Manager for review. The ENTACT Project Manager will then prepare monthly reports and the final report to the U.S. EPA Project Coordinator. The appropriate documents will be prepared and distributed that summarize both the field activities performed and the results obtained. The field reports will include: presentation of results, summaries of field data from field measurements, and field location of sampling points. All other information will be bound in the appendices. The laboratory reports will include at a minimum the following components:

- Report title page;
- Date of issuance;
- Any deviations from the intended analytical strategy;
- Laboratory batch number;
- Number of samples and respective matrices;
- Project name and number;
- Condition of samples;
- Discussion of holding times;
- Discussion of technical problems or observations;
- Discussion of quality control checks which failed;
- Sample description information;
- Analytical tests assigned;
- Analytical results;
- Quality control reports;
- Description of analytical methodology;
- Description of QC methodology; and
- Signature of Laboratory Operations Manager.

Both the field and laboratory reports will contain the following:

- Any changes in the QA Project Plan;
- Significant QA problems, recommended solutions, and results of corrective actions;
- Discussions of whether the QA objectives were met, and the resulting impact on decision making; and
- Limitations on the use of the measurement data

## 10.0 PERFORMANCE AND SYSTEMS AUDITS

Two types of audit procedures will be used to assess and document performance and project staff: system audits and performance audits. These audits are performed at frequent intervals under the direction of the ENTACT QA Manager to evaluate quantitatively the accuracy of the total measurement system. These audits form the basis for corrective action requirements and provide a permanent record of the conformance of measurement systems to QA requirements.

System audits consist of quantitative evaluation of field and laboratory quality control measurement systems to determine if they are used appropriately. These audits may be carried out before all systems are operational, during the program, or after the completion of the program. These audits involve a comparison of the activities presented in the QA plan with those actually scheduled or performed.

Performance audits are a quantitative evaluation of the measurement systems of the program. They require testing of the measurement systems with samples of known composition or behavior to evaluate precision and accuracy after systems are operational and generating data. Analytical laboratories designated to perform analytical services during the removal action at MMI will be audited prior to sample analysis.

### 10.1 INTERNAL AUDITS

A systems audit will be performed prior to or shortly after systems are operational on laboratory, office, and field operations. The system audit protocols are summarized as follows:

#### Laboratory Operations: Laboratory QA Manager

- Parameter and/or laboratory notebooks;
- Instrument/equipment logbook;
- Sample log-in, routing, and labeling for analysis; and
- Updating of QC criteria for spike recoveries. In addition, the QA Manager will monitor analyses to assure complete adherence to approved analytical methods.

#### Field Operations: ENTACT QA Officer

- Field notebooks, procedures, field logs, boring logs, etc.
- Site safety;
- Sampling methods; and
- Sample labeling, packing, storage, shipping, and chain-of-custody procedures.

#### Office Operations: ENTACT Administrative Project Manager

- Project team members are informed of the team organization and in particular the quality control procedures for their work assignment; and
- Quality control officers assigned to the project are available and informed of the quality control they are responsible for, and the schedule for quality control review.

After systems are operational and generating data, a performance audit will be conducted at least once during the laboratory, office, and field work to determine the accuracy of the total measurement systems or component parts thereof. The performance audit protocol is summarized as follows:

#### Laboratory Operations: Laboratory QA Manager

- Sample log-in, routing, and labeling for analysis;
- Analyses to assure complete adherence to approved test methods; and
- Other quality control procedures outlined herein.

Field Operations: ENTACT QA Officer

- Field notebooks, procedures, field logs, boring logs, etc.
- Site safety;
- Sampling methods; and
- Sample labeling, packing, storage, shipping, and chain-of-custody procedures.

Office Operations: ENTACT Administrative Project Manager

- Specified quality control reviews of the work are being performed;
- The individuals performing the quality control reviews are qualified and as assigned; and
- Final reports and deliverables have received the appropriate QC review.

The auditor will maintain a record of his evaluation by writing field notes. Following the audit, the preliminary results will be reviewed with the person in charge of the operations audited. Subsequent to the audit, the auditor will develop an audit report that summarizes the areas requiring corrective measures. This report will be submitted to the ENTACT Project Manager.

When it is necessary to determine the capacity of a subcontractor's quality assurance program prior to award of subcontractor, the ENTACT Project Manager, ENTACT QA Technician, and/or ENTACT QA Manager will visit the subcontractor's operations to verify performance and services.

## 10.2 EXTERNAL AUDITS

In addition to these internal field and laboratory audits, the USEPA Region 5 QA reviewer from FSS may conduct external field and laboratory audits. External field and laboratory audits may also be performed by the US EPA Project Coordinator. The external field audits may be conducted any time during the field operations and may or may not be announced. An external audit may be performed at least once prior to the initiation of the sampling and analysis activities. These audits may or may not be announced. The external lab audit will include (but not be limited to) review of laboratory procedures, laboratory on-site audits, and/or submission of performance verification samples to the laboratory for analysis.



## 11.0 PREVENTATIVE MAINTENANCE

To minimize the occurrence of instrument failure and other system malfunction, a preventative maintenance program for field and laboratory instruments will be implemented. Equipment, instruments, tools, gauges, and other items requiring preventative maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedures developed by the operators. Maintenance items that cannot be performed by the laboratory technician will be performed by a person certified to repair the instrument. The laboratory will be responsible for performing routine maintenance and will have available tools and spare parts to conduct routine maintenance. A backup XRF unit will be available for use in the case of a malfunction to avoid downtime.

Manufacturer's procedures identify the schedule for servicing critical items in order to minimize the downtime for the measurement system. It will be the responsibility of the field instrument operator and the laboratory to adhere to this maintenance schedule and arrange any necessary and prompt service. In addition to any manufacturer recommended maintenance criteria, a maintenance procedure will be developed by the operator based upon experience and previous use of the equipment. Service to the equipment, instruments, tools, gauges, etc., shall be performed by qualified personnel. Periodic maintenance is shown on Table QAPP-9.

Logs are used to record maintenance and service procedures and schedules. All maintenance records will be documented and traceable to the specific equipment, instruments, tools, and gauges. Any items found to be inoperable will be taken out of use and a note stating the time and date of this action will be made in the calibration sheets and logs. The reason for equipment failure and the time and date of its return to service will also be noted in the logbook. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories and by the data and sample control personnel when and if equipment, instruments, tools, and gauges are used at the site. The ENTACT Project Manager will audit these procedures.

**Table QAPP-9**  
**Maintenance Procedures for Field and Laboratory Equipment**

<b>Instrumentation</b>	<b>Maintenance Procedure</b>	<b>Spare Parts</b>
Field XRF	<ol style="list-style-type: none"> <li>1. Leak testing every six months</li> <li>2. Shutter check every six months</li> <li>3. Annual manufacturer servicing</li> </ol>	Battery packs XRF Cables
Gas Chromatograph/Mass Spectrometer	<ol style="list-style-type: none"> <li>1. Change septa as needed</li> <li>2. Change syringes on autosamplers as needed</li> <li>3. Leak check when installing columns</li> <li>4. Injection port cleaning as needed</li> <li>5. Check inlet system for residue buildup periodically</li> <li>6. Clean gas line dryers as needed</li> <li>7. Replace pump oil as needed</li> <li>8. Replace electron multiplier as needed</li> </ol>	Syringe Septa Various electronic components Plumbing supplies Injection port liners
ICP Spectrometer	<ol style="list-style-type: none"> <li>1. Change sample rinse lines</li> <li>2. Clean nebulizer components and torch assembly</li> <li>3. Clean filters</li> <li>4. Clean mirrors</li> </ol>	Nebulizer components Torch assembly Pump tubing Sample probe
Temperature/pH/Conductivity and turbidity meters	<ol style="list-style-type: none"> <li>1. Calibrate as required by manufacturer's instruction</li> <li>2. Replace as needed</li> <li>3. Check batteries if does not calibrate</li> </ol>	pH buffers Batteries Spare electrodes

## 12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

This section summarizes the QA/QC procedures used in assessing the quality of the chemical data and the format for presenting the results of the QA/QC evaluations. The data evaluation procedures will be used by the QA Manager for assessing duplicate and spike samples and checking blank samples that are submitted blind to the analytical laboratories from the field or generated internally by the laboratory, in accordance with this QAPP. The purpose of implementing these procedures is to assess the chemical data generated for accuracy, precision, representativeness, and completeness for both the laboratory analytical program and field sample collection activities.

The primary goal of the program is to ensure that the data generated are representative of environmental conditions at the site. Accuracy, precision, representativeness, and completeness will be computed in the manner described in the following paragraphs. A qualitative assessment of accuracy, precision, representativeness, and completeness will be made and documented. The goal of the assessment will be to (1) establish site specific PARCC parameters; (2) use the parameters to develop a database with known limitations of data usability; and (3) evaluate these limitations in achieving the project DQOs. Complex statistical data verification and a significance evaluation will not be performed. If a problem arises and the data are found to deviate from previous analyses or surrounding conditions, the data will be annotated. Sample recollection and analysis will be used only in extreme cases of QC problems.

Chemical data will be evaluated according to accuracy, precision, representativeness, and completeness criteria for both the field sample collection activities and laboratory analytical programs. The QA/QC program will evaluate data based on three types of quality control samples (matrix spikes, blanks, and duplicates).

The completeness of the data represents the amount of valid data obtained from the field programs versus the amount of data expected under normal conditions. Completeness will be assessed prior to preparation of the final report. These procedures for evaluating the field and laboratory QA/QC data are the same and are presented below for QA/QC matrix spike, blank, and duplicate samples.

### 12.1 ACCURACY ASSESSMENT

In order to assure the accuracy of the analytical procedures, an environmental sample is randomly selected from each sample shipment received at the laboratory, and spiked with a known amount of the analyte to be evaluated. In general, a sample spike should be included in every set of 20 samples tested on each instrument. The spike sample is then analyzed. The increase in concentration of the analyte observed in the spiked sample, due to the addition of a known quantity of the analyte, compared to the reported value of the same analyte in the unspiked sample determines the percent recovery. The percent recovery for a spiked sample is calculated according to the following formula:

$$\% \text{ Recovery} = \frac{\text{Amount in spiked sample} - \text{Amount in sample}}{\text{Known amount added}} \times 100$$

### 12.2 PRECISION ASSESSMENT

Spiked samples are prepared by choosing a sample at random from each sample shipment received at the laboratory, dividing the sample into equal aliquots, and then spiking each of the aliquots with a known amount of analyte. The duplicate samples are then included in the analytical sample set. The splitting of the sample allows the analyst to determine the precision of the preparation and analytical techniques associated with the duplicate sample. The

relative percent difference (RPD) between the spike and duplicate spike are calculated and plotted. The RPD is calculated according to the following formula:

$$RPD = \frac{\text{Amount in Spike 1} - \text{Amount in Spike 2}}{0.5 (\text{Amount in Spike 1} + \text{Amount in Spike 2})} \times 100$$

### 12.3 COMPLETENESS ASSESSMENT

Completeness is the ratio of the number of valid sample results to the total number of samples analyzed with a specific matrix and/or analysis. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{Completeness} = \frac{(\text{Number of valid measurements})}{(\text{Number of measurements planned})} \times 100$$

## 13.0 CORRECTIVE ACTION

The following procedures have been established to assure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected. When a significant condition adverse to quality is noted at the site, laboratory, or subcontractor locations, the cause of the condition will be determined and corrective action taken immediately. All project personnel have the responsibility to promptly identify, solicit approved correction, and report conditions adverse to quality. Conditions, which warrant corrective action, include:

- Predetermined acceptance standards are not attained;
- Procedures or data compiled are determined to be faulty;
- Equipment or instrumentation is found to be faulty;
- Samples and test results are questionably traceable;
- Quality assurance requirements have been violated; and
- System and performance audits indicate problems.

### 13.1 FIELD CORRECTIVE ACTION

The need for corrective action will be identified as a result of the field audits previously described. If problems become apparent that are identified as originating in the field, immediate corrective action will take place. If immediate corrective action does not resolve the problem, appropriate personnel will be assigned to investigate and evaluate the cause of the problem. When a corrective action is implemented, the effectiveness of the action will be verified such that the end result is elimination of the problem.

Corrective action in the field can be needed when the sample network is changed, sampling procedures, and field analytical procedures require modification due to unexpected conditions. In general, the Field Team, Field Coordinator, QA Technician, QA Manager, and Project Manager may identify the need for corrective action. The ENTACT field staff in consultation with the ENTACT Field Coordinator will recommend the corrective action. The ENTACT Field Coordinator will approve the corrective measure, which will be implemented by the ENTACT Field Team. It will be the responsibility of the ENTACT Field Coordinator and the ENTACT Project Manager to ensure that corrective action has been implemented.

If the corrective action will supplement the existing sampling plan using existing and approved procedures in the QAPP, corrective action approved by the ENTACT Field Coordinator will be documented. If corrective actions resulting in fewer samples, alternate locations, etc. which may cause project quality assurance objectives not to be achieved, it will be necessary that all levels of project management, including U.S. EPA, concur with the proposed action.

Corrective action resulting from internal field audits will be implemented immediately if data may be adversely affected due to unapproved or improper use of approved methods. The ENTACT QA Manager will identify deficiencies and recommended corrective action to the ENTACT Project Manager. Implementation of corrective actions will be performed by the ENTACT Field Coordinator and the ENTACT Field Team. Corrective action will be documented in quality assurance reports to the entire project management. The U.S. EPA will be notified immediately if any problems affecting data quality occur.

Corrective actions will be implemented and documented in the field record book. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective actions are insufficient, work may be stopped by the US EPA Remedial Project Manager.

### **13.2 LABORATORY CORRECTIVE ACTION**

The need for corrective action resulting from QA audits will be initiated by the laboratory QA/QC Manager in consultation with the Laboratory Operations Manager. The corrective action will be performed prior to the release of data from the laboratory. The corrective action will be documented in the logbook and submitted to the data validator. If the corrective action does not rectify the situation, the laboratory will contact the ENTACT Project Manager. If the nonconformance causes project objectives not to be achieved, it will be necessary to inform all levels of ENTACT management at the MMI site and the US EPA Project Coordinator. Corrective action may include, but is not limited to:

- Reanalyzing the samples, if holding time criteria permit;
- Evaluating and amending sampling and analytical procedures;
- Accepting data with an acknowledged level of uncertainty; and
- Resampling and analysis, if the completeness of the data set or intended use of the data is recognized during a preliminary review to be insufficient to meet program DQOs.

If the above corrective actions are deemed unacceptable, an alternate laboratory will be selected to perform necessary analyses.

### **13.3 CORRECTIVE ACTION DURING DATA VALIDATION AND DATA ASSESSMENT**

The facility may identify the need for corrective action during either the data validation or data assessment. Potential types of corrective action may include resampling by the field team or reinjection/reanalysis of samples by the laboratory. These actions are dependent upon the ability to mobilize the field team, and whether the data to be collected is necessary to meet the required quality assurance objectives (e.g. the holding time has not been exceeded, etc.). The ENTACT QA Manager is responsible for identifying a corrective action situation, documenting the incident, determining the course of action, and implementing the corrective action.

### **13.4 IMMEDIATE CORRECTIVE ACTION**

Any equipment and instrument malfunctions will require immediate corrective actions. The laboratory QC charts are working tools that identify appropriate immediate corrective actions to be taken when a control limit has been exceeded. They provide the framework for uniform actions as part of normal operating procedures. The actions taken should be noted in field or laboratory logbooks. A detailed description of method-specific corrective action limits is provided in the appropriate method. Any deviation from the prescribed control limits must be approved in writing by the ENTACT QA Manager.

### **13.5 LONG-TERM CORRECTIVE ACTION**

The need for long-term corrective action may be identified by standard QC procedures, control charts, and system audits. Any procedural or data quality problem that cannot be solved by immediate corrective action becomes a long-term corrective action. The essential steps in a corrective action system are as follows:

- Identification and definition of the problem;
- Investigation and determination of the cause of the problem;
- Determination and implementation of a corrective action to eliminate the problem; and
- Verification that the corrective action has eliminated the problem.

Documentation of the problem is important in corrective action. The responsible person may be an analyst, ENTACT QA Manager, laboratory QA Manager, sampler, or the ENTACT Project Manager. In general, the designated QA Manager will investigate the situation and determine who will be responsible for implementing the corrective action. The QA Manager will verify that the corrective action has been taken, appears effective, and that the problem has been resolved.

The required corrective action will be documented by the designated ENTACT QA Manager and the ENTACT Project Manager for field activities. The corrective action will be discussed with the ENTACT Project Manager and the EPA Project Manager prior to implementation if the severity of the problem warrants such discussion.

Any changes proposed for amending sampling and analytical procedures will be approved by the EPA prior to implementation. These changes will be documented in monthly progress reports and addenda to the QAPP.

Project management and staff, including field investigation teams, document and sample control personnel, and laboratory groups, will monitor on-going work performance in the normal course of daily responsibilities. Work will be monitored at the site by the ENTACT Project Manager.

Following identification of an adverse condition or quality assurance problem, the ENTACT QA Manager will notify the ENTACT Project Manager of the problem.

## **14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT**

### **14.1 CONTENTS OF A PROJECT QA REPORT**

Analytical results of samples analyzed during the remedial action will be submitted to the Project Manager following a QA/QC review. The results will include a tabulation of the analytical data and an explanation of any field conditions or laboratory QA/QC problems and their effects on data quality. Results of performance audits and system audits will also be included, as appropriate. Proposed corrective action will be recommended in the event that QA problems are identified during review of data quality or results of performance or system audits.

The final report will contain a discussion of QA/QC evaluations summarizing the quality of the data collected and/or used as appropriate to each activity of the project. The objective of the QA/QC summary will be to ensure that the data are representative of site conditions and sufficient in quality and quantity to support the field activities. The QA/QC summary will include:

- Tabulated results of all field and analytical data;
- A report from the laboratory QA Manager evaluating the validity of the analytical data with respect to accuracy, precision, completeness, and representativeness; and
- A report from the Project Manager evaluating the results of field and office audits.

A quality assurance report will be prepared by the QA Manager upon receipt of sufficient QA data from the laboratory. The report will be a summary of QA/QC results of the analytical work conducted and will be included as part of the final remedial action report.

### **14.2 QA REPORTING AND ROUTING SCHEDULE**

The QA Reports will be prepared on a monthly basis and will be delivered to all recipients by the end of the first full week of the month. The reports will continue without interruption, until the project has been completed. All individuals identified in the Project Organization Chart will receive copies of the monthly QA Report.



## **ATTACHMENT QAPP-A**

### **LABORATORY STANDARD OPERATING PROCEDURES**

[SOPs for each laboratory method filed at the ENTACT Wood Dale, Illinois office – copies were submitted to, and reviewed and approved by, the USEPA QAPP Reviewer]

**ATTACHMENT B**

**GEOANALYTICAL, INC. QUALITY CONTROL CRITERIA**

TABLE 1.  
QUALITY CONTROL FOR ORGANIC CONTAMINANTS IN WATER METHODS

Frequency of method blanks	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch
Frequency of Instrument or Reagent blanks	one per ten analytical samples.	one per ten analytical samples.	one per twenty analytical samples.	one per ten analytical samples.	one per ten analytical samples.	one per 12 hour clock	one per 12 hour clock	one per ten analytical samples.	one per ten analytical samples.
Surrogates	placed in all samples, blanks, spikes, duplicates. Acceptable recovery ranges in Table 11.	placed in all samples, blanks, spikes, duplicates. Acceptable recovery ranges in Table 11.	placed in all samples, blanks, spikes, duplicates. Acceptable recovery ranges in Table 11.	placed in all samples, blanks, spikes, duplicates. Acceptable recovery ranges in Table 11.	placed in all samples, blanks, spikes, duplicates. Acceptable recovery ranges in Table 11.	placed in all samples, blanks, spikes, duplicates. Acceptable recovery ranges in Table 11.	placed in all samples, blanks, spikes, duplicates. Acceptable recovery ranges in Table 11.	n/a	n/a
Laboratory Control Samples	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.
Frequency of MS and MSD's	one MS/MSD per 20 samples or analytical batch.	one MS/MSD per 20 samples or analytical batch.	one MS/MSD per 20 samples or analytical batch.	one MS/MSD per 20 samples or analytical batch.	one MS/MSD per 20 samples or analytical batch.	one MS/MSD per 20 samples or analytical batch.	one MS/MSD per 20 samples or analytical batch.	one MS/MSD per 20 samples or analytical batch.	one MS/MSD per 20 samples or analytical batch.
Accuracy and Precision	compound dependent, see Table 8C.	compound dependent, see Table 8C.	compound dependent, see Table 8F.	compound dependent, see Table 8E.	compound dependent, see Table 19.	compound dependent, see Table 7A.	compound dependent, see Table 7B.	Table 8D.	Table 8D.
Internal standards	no	no	no	no	no	yes	yes	no	no
Initial Calibration	3 point minimum $\leq 10\%$ for average RF	5 point minimum $\leq 20\%$ for average RF	5 point minimum $\leq 20\%$ for average RF	5 point minimum $\leq 20\%$ for average RF	5 point minimum $\leq 20\%$ for average RF	5 point minimum $\leq 30\%$ RSD for average RF of CCC's, $\leq 15\%$ RSD for all others	5 point minimum $\leq 30\%$ RSD for average RF	5 point minimum $\leq 20\%$ RSD for average RF	5 point minimum $\leq 20\%$ RSD for average RF
Continuing calibration check	calibration standard run every 10 samples and must be within $\pm 15\%$ diff. of average RF	calibration standard run every 10 samples and must be within $\pm 15\%$ diff. of average RF	calibration standard run every 10 samples and must be within $\pm 15\%$ diff. of average RF	calibration standard run every 10 samples and must be within $\pm 15\%$ diff. of average RF	calibration standard run every 10 samples and must be within $\pm 15\%$ diff. of average RF	calibration standard run every 12 hours. CCC's must be within $\pm 20\%$ drift criteria.	calibration standard run every 12 hours. CCC's must be within $\pm 20\%$ drift criteria.	calibration standard run every 10 samples and must be within $\pm 15\%$ diff. of average RF	calibration standard run every 10 samples and must be within $\pm 15\%$ diff. of average RF
Tuning Parameters	n/a	n/a	n/a	n/a	n/a	BFB to criteria in Table 5, every 12 hours while samples are being run.	DFTPP to criteria in Table 5, every 12 hours while samples are being run.	n/a	n/a
Detection limits	Table 18.	Table 18.	Table 18.	Table 19.	Table 19.	Table 13.	Table 15.	Table 18.	Table 18.

**TABLE 2.**  
**QUALITY CONTROL FOR ORGANIC CONTAMINANTS IN SOIL METHODS**

	<b>GAM 8020</b>	<b>GAM 8081</b>	<b>GAM 8100</b>	<b>GAM 8121</b>	<b>GAM 8260</b>	<b>GAM 8270</b>	<b>GAM 418.1</b>	<b>GAM 8015 modified</b>
<b>Frequency of method blanks</b>	one per every analytical batch or 20 samples.	one per every analytical batch or 20 samples.	one per every analytical batch or 20 samples.	one per every analytical batch or 20 samples.	one per every analytical batch or 20 samples.	one per every analytical batch or 20 samples.	one per every analytical batch or 20 samples.	one per every analytical batch or 20 samples.
<b>Frequency of Reagent blanks</b>	One per ten analytical samples.	One per twenty analytical samples.	One per ten analytical samples.	One per ten analytical samples.	One per 12 hour clock	One per 12 hour clock.	One per ten analytical samples.	One per ten analytical samples.
<b>Surrogates</b>	placed in all samples, blanks, spikes, duplicates. %R ranges in Table 11.	placed in all samples, blanks, spikes, duplicates. %R ranges in Table 11.	placed in all samples, blanks, spikes, duplicates. %R ranges in Table 11.	placed in all samples, blanks, spikes, duplicates. Acceptable recovery range 10 - 150.	placed in all samples, blanks, spikes, duplicates. %R ranges in Table 11.	Placed in all samples, blanks, spikes, duplicates. %R ranges in Table 11.	n/a	n/a
<b>Laboratory Control Samples</b>	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.
<b>Frequency of MS and MSD</b>	one MS/MSD per every analytical batch or 20 samples.	one MS/MSD per every analytical batch or 20 samples.	one MS/MSD per every analytical batch or 20 samples.	one MS/MSD per every analytical batch or 20 samples.	one MS/MSD per every analytical batch or 20 samples.	one MS/MSD per every analytical batch or 20 samples.	one MS/MSD per every analytical batch or 20 samples.	one MS/MSD per every analytical batch or 20 samples.
<b>Accuracy Precision</b>	compound dependent see Table 8C.	compound dependent see Table 8F.	compound dependent see Table 8E.	compound dependent see Table 19.	compound dependent see Table 8A.	compound dependent see Table 8B.	Table 8D.	Table 8D.
<b>Internal standards</b>	no	no	no	no	yes	yes	no	no
<b>Initial calibration</b>	5 point minimum $\leq$ 20% RSD for average RF	5 point minimum $\leq$ 20% RSD for average RF	5 point minimum $\leq$ 20% RSD for average RF	5 point minimum $\leq$ 20% RSD for average RF	5 point minimum $\leq$ 30% RSD for average RF of CCC's, $<$ 15% RSD for all others	5 point minimum $\leq$ 30% RSD for average RF of CCC	5 point minimum $\leq$ 20% RSD for average RF	5 point minimum $\leq$ 20% RSD for average RF
<b>Continuing Calibration Check</b>	calibration standard run every 10 samples and must be within $\pm$ 15 % diff. of average RF	calibration standard run every 10 samples and must be within $\pm$ 15 % diff. of average RF	calibration standard run every 10 samples and must be within $\pm$ 15 % diff. of average RF	calibration standard run every 10 samples and must be within $\pm$ 15 % diff. of average RF	calibration standard run every 12 hours and must be within $\pm$ 20 % diff. of average RF	calibration standard run every 12 hours and CCC's must be within $\pm$ 20 % drift criteria.	calibration standard run every 10 samples and CCC's must be within $\pm$ 20 % drift criteria.	calibration standard run every 10 samples and must be within $\pm$ 15 % diff. of average RF
<b>Ending Calibration Check</b>	run at the end of each sequence and must be within $\pm$ 15 % diff. of average RF	run at the end of each sequence and must be within $\pm$ 15 % diff. of average RF	run at the end of each sequence and must be within $\pm$ 15 % diff. of average RF	run at the end of each sequence and must be within $\pm$ 15 % diff. of average RF	n/a	n/a	run at the end of each sequence and must be within $\pm$ 15 % diff. of average RF	run at the end of each sequence and must be within $\pm$ 15 % diff. of average RF

TABLE 3.  
QUALITY CONTROL FOR METALS IN WATER METHODS

Frequency of method blanks	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch
Initial Calibration	following instrument calibration and must be less than the minimum reporting limit or less than 10% or the sample concentration.	following instrument calibration and must be less than the minimum reporting limit or less than 10% or the sample concentration.	following instrument calibration and must be less than the minimum reporting limit or less than 10% or the sample concentration.	following instrument calibration and must be less than the minimum reporting limit or less than 10% or the sample concentration.
Initial Calibration	following instrument calibration verify calibration with an independently prepared check standard. % R = 95 - 105 %	following instrument calibration verify calibration with the calibration standard. % R = 95 - 105 %	following instrument calibration verify calibration with an independently prepared check standard. % R = 95 - 105 %	following instrument calibration verify calibration with an independently prepared check standard. % R = 90 - 110 %
Laboratory	one LCS per 20 samples or analytical batch	one LCS per 20 samples or analytical batch	one LCS per 20 samples or analytical batch	one LCS per 20 samples or analytical batch
Frequency of MS and MSD's	one MS/MSD per 20 samples or analytical batch	one MS/MSD per 20 samples or analytical batch	one MS/MSD per 20 samples or analytical batch	one MS/MSD per 20 samples or analytical batch
Accuracy and Precision	compound dependent. see Table 19.	compound dependent. see Table 19.	compound dependent. see Table 19.	compound dependent. see Table 19.
Internal Standards	no	no	no	no
Initial Calibration	one level and a blank	one level and a blank	5 levels and a blank $r^2 \geq 0.995$	5 levels and a blank $r^2 \geq 0.995$
Continuing Calibration Blank Verification (CCB)	after every ten samples and at the end of each sequence and must be less than the minimum reporting limit or less than 10% of the sample concentration	after every ten samples and at the end of each sequence and must be less than the minimum reporting limit or less than 10% of the sample concentration	after every ten samples and at the end of each sequence and must be less than the minimum reporting limit or less than 10% of the sample concentration	after every ten samples and at the end of each sequence and must be less than the minimum reporting limit or less than 10% of the sample concentration
Continuing Calibration Verification (CCV)	after every ten samples and at the end of each sequence and must be within 90-100% of initial calibration.	after every ten samples and at the end of each sequence and must be within 90-100% of initial calibration.	after every ten samples and at the end of each sequence and must be within 90-100% of initial calibration.	after every ten samples and at the end of each sequence and must be within 90-100% of initial calibration.
Interference Check Samples (ICS)	Run at the beginning and end of each sequence or every 8 hours. ICSA target analytes must be below reporting limit or less than 10% of the sample concentration. ICSAB target analytes must be within $\pm 20\%$ of expected.	Run at the beginning and end of each sequence or every 8 hours. ICSA target analytes must be below reporting limit or less than 10% of the sample concentration. ICSAB target analytes must be within $\pm 20\%$ of expected.	n/a	n/a
Mass Calibration and Performance Parameters	n/a	n/a	n/a	n/a
Detection Limits	Table 19.	Table 19.	0.2 ug/L based on a 0.1 L sample	0.2 ug/L based on a 0.1 L sample

**TABLE 4.**  
**QUALITY CONTROL FOR METALS IN SOIL METHODS**

	<b>GAM 6010</b>	<b>GAM 7471 (MERCURY)</b>
<b>Frequency of method blanks</b>	one per every 20 samples or analytical batch.	one per every 20 samples or analytical batch.
<b>Initial Calibration Blank Verification (ICB)</b>	following instrument calibration and must be less than the minimum reporting limit or less than 10% of the sample concentration.	following instrument calibration and must be less than the minimum reporting limit or less than 10% of the sample concentration.
<b>Initial Calibration Verification (ICV)</b>	following instrument calibration verify calibration with an independently prepared check standard. % R = 95 - 105 %	following instrument calibration verify calibration with an independently prepared check standard. % R = 90 - 110%
<b>Laboratory Control Samples</b>	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.
<b>Frequency of MS and MSD's</b>	one MS/MSD per 20 samples or analytical batch.	one MS/MSD per 20 samples or analytical batch.
<b>Accuracy and Precision</b>	compound dependent see Table 20.	compound dependent see Table 20.
<b>Internal standards</b>	no	no
<b>Initial calibration</b>	one level and a blank	5 levels and a blank $r^2 \geq 0.995$
<b>Continuing Calibration Blank Verification (CCB)</b>	after every ten samples and at the end of each sequence and must be less than the minimum reporting limit or less than 10% of the sample concentration.	after every ten samples and at the end of each sequence and must be less than the minimum reporting limit or less than 10% of the sample concentration.
<b>Continuing Calibration Verification (CCV)</b>	after every ten samples and at the end of each sequence and must be within 90 - 100 % of initial calibration.	after every ten samples and at the end of each sequence and must be within 80 - 120 % of initial calibration.
<b>Interference Check Samples (ICS)</b>	Run at the beginning and end of each sequence or every 8 hours. ICSA target analytes must be below reporting limit or less than 10% of the sample concentration. ICSAB target analytes must be $\pm 20$ % of expected.	n/a.
<b>Mass Calibration and Performance Parameters</b>	n/a.	n/a.
<b>Detection limits</b>	Table 19.	0.1 mg/Kg based on a 1.0 gram sample

**TABLE 5.**  
**ION ABUNDANCE TUNING CRITERIA FOR 4-BROMOFLUOROBENZENE (BFB)**  
**Criteria for 624, 8260**

m/e	RELATIVE ABUNDANCE CRITERIA
50	15.0 - 40.0 % of mass 95.
75	30.0 - 60.0 % of mass 95.
95	Base peak, 100 % relative abundance.
96	5.0 - 9.0 % of mass 95.
173	Less than 2.0 % of mass 174.
174	Greater than 50.0 % of mass 95.
175	5.0 - 9.0 % of mass 174.
176	> 95.0 % but < 101.0 % of mass 174.
177	5.0 - 9.0 % of mass 176.

**Criteria for 524.2**

m/e	RELATIVE ABUNDANCE CRITERIA
50	15.0 - 40.0 % of mass 95.
75	30.0 - 80.0 % of mass 95.
95	Base peak, 100 % relative abundance.
96	5.0 - 9.0 % of mass 95.
173	Less than 2.0 % of mass 174.
174	Greater than 50.0 % of mass 95.
175	5.0 - 9.0 % of mass 174.
176	> 95.0 % but < 101.0 % of mass 174.
177	5.0 - 9.0 % of mass 176.

**ION ABUNDANCE TUNING CRITERIA FOR DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)**

**Criteria used for EPA Method 625**

m/e	RELATIVE ABUNDANCE CRITERIA
51	30 - 60 % of mass 198.
68	Less than 2 % of mass 69.
70	Less than 2 % of mass 69.
127	40 - 60 % of mass 198.
197	Less than 1 % of mass 198.
198	Base peak, 100% relative abundance
199	5 - 9 % of mass 198.
275	10 - 30 % of mass 198.
365	Greater than 1 % of base peak.
441	Present but less than mass 443.
442	Greater than 40 % of mass 198.
443	17 - 23 % of mass 442.

**Criteria used for EPA Methods 525 and 8270**

m/e	RELATIVE ABUNDANCE CRITERIA
51	10 - 80 % of mass 198.
68	Less than 2 % of mass 69.
70	Less than 2 % of mass 69.
127	10 - 80 % of mass 198.
197	Less than 1 % of mass 198.
198	Base peak or >50 % of mass 442
199	5 - 9 % of mass 198.
275	10 - 60 % of mass 198.
365	Greater than 1 % of base peak.
441	Present but less than mass 443.
442	Base peak or > 50 % of mass 198.
443	15 - 24 % of mass 442.

**TABLE 6.**  
**CALIBRATION AND SYSTEM PERFORMANCE CHECK CRITERIA FOR SW846 METHOD 8260**

**Calibration Check Compounds (CCC)**

CCC's for VOLATILE ORGANICS	Recommended %RSD for Linear Fit	Maximum %RSD for Initial Calibration	Maximum %Drift for Continuing Calibration
1,1-Dichloroethene	15	30	20
Chloroform	15	30	20
1,2-Dichloropropane	15	30	20
Toluene	15	30	20
Ethylbenzene	15	30	20
Vinyl Chloride	15	30	20

**System Performance Check Compounds (SPCC)**

SPCC's for VOLATILE ORGANICS	Minimum RRF	Minimum RRF for Continuing Calibration
Chloromethane	0.10	0.10
1,1-Dichloroethane	0.10	0.10
Bromoform	> 0.10	> 0.10
Chlorobenzene	0.30	0.30
1,1,2,2-Tetrachloroethane	0.30	0.30

\* - % Drift =  $(C_1 - C_C)/C_1 \times 100$  where  $C_1$  = concentration of the CCC standard  
 $C_C$  = measured concentration using selected quantitation method.

Initial calibration criteria for the remaining compounds states that if %RSD for the five point curve is less than or equal to 15%, the relative response factor is assumed to be constant over the calibration range and the average response factor may be used. If the %RSD is greater than 15%, a calibration curve is constructed using the area ratio ( $A/A_{is}$ ) versus concentration using the first or higher order regression fit of the five point curve. The regression fit that introduces the least amount of error should be selected.



**TABLE 7.**  
**Acceptance Limits for Laboratory Control Samples, Matrix Spikes and Spike Duplicates**

**(A) VOLATILE ORGANICS BY GC/MS**

COMPOUNDS	Water Methods (EPA SW846)	LC5 Accuracy %R	Water Accuracy %R	Water Precision RPD	Soil Methods (SW846)	Soil Accuracy %R	Soil Precision RPD
1,1-Dichloroethene	624, 8240, 8260	70 - 125	73 - 140	16	8240, 8260	36 - 156	19
Trichloroethene	624, 8240, 8260	75 - 123	65 - 137	11	8240, 8260	50 - 119	21
Benzene	624, 8240, 8260	80 - 116	76 - 133	11	8240, 8260	55 - 115	21
Toluene	624, 8240, 8260	76 - 120	62 - 147	13	8240, 8260	54 - 117	19
Chlorobenzene	624, 8240, 8260	85 - 115	68 - 143	12	8240, 8260	51 - 124	21

**(B) SEMI-VOLATILE ORGANICS BY GC/MS**

COMPOUNDS	Water Methods (EPA SW846)	Water Accuracy %R	Water Precision RPD	Soil Methods (SW846)	Soil Accuracy %R	Soil Precision RPD
Phenol	625, 8270	12 - 112	42	8270	47 - 114	33
2-Chlorophenol	625, 8270	27 - 123	40	8270	49 - 115	24
4-Chloro-3-methylphenol	625, 8270	30 - 120	31	8270	39 - 132	23
4-Nitrophenol	625, 8270	10 - 80	50	8270	11 - 114	50
Pentachlorophenol	625, 8270	32 - 129	27	8270	5 - 142	17
1,4-Dichlorobenzene	625, 8270	36 - 97	28	8270	29 - 133	26
N-Nitroso-di-n-propylamine	625, 8270	23 - 121	38	8270	48 - 129	23
1,2,4-Trichlorobenzene	625, 8270	39 - 98	28	8270	44 - 121	23
Acenaphthene	625, 8270	46 - 118	31	8270	56 - 125	19
2,4-Dinitrotoluene	625, 8270	30 - 121	41	8270	46 - 114	21
Pyrene	625, 8270	50 - 129	37	8270	50 - 140	24

**(C) AROMATIC VOLATILE ORGANICS BY GC (LOW LEVEL METHOD)**

COMPOUNDS	Water Methods (EPA SW846)	Water Accuracy %R	Water Precision RPD	Soil Methods (SW846)	Soil Accuracy %R	Soil Precision RPD
Benzene	602, 8020	82 - 115	0 - 6	8020	79 - 115	0 - 6
Toluene	602, 8020	83 - 116	0 - 6	8020	78 - 117	0 - 7
Chlorobenzene	602, 8020	86 - 116	0 - 4	8020	79 - 115	0 - 8
Ethylbenzene	602, 8020	85 - 115	0 - 5	8020	74 - 121	0 - 7
m&p-Xylene	602, 8020	84 - 115	0 - 7	8020	72 - 123	0 - 7
o-Xylene	602, 8020	83 - 117	0 - 6	8020	75 - 122	0 - 6
1,3-Dichlorobenzene	602, 8020	88 - 116	0 - 7	8020	62 - 127	0 - 8
1,4-Dichlorobenzene	602, 8020	85 - 112	0 - 7	8020	66 - 127	0 - 8
1,2-Dichlorobenzene	602, 8020	87 - 116	0 - 5	8020	63 - 125	0 - 7

**(D) TOTAL PETROLEUM HYDROCARBONS**

COMPOUNDS	Water Methods (EPA SW846)	Water Accuracy %R	Water Precision RPD	Soil Methods (SW846)	Soil Accuracy %R	Soil Precision RPD
Total petroleum hydrocarbons IR	418.1	81 - 112	0 - 6	8073	82 - 102	0 - 8
TPH GRO GC	8015	71 - 115	0 - 17	8015	85 - 120	0 - 20
TPH DRO GC	8015	48 - 121	0 - 15	8015	84 - 122	0 - 18

**TABLE 7. (cont.)**  
**Acceptance Limits for Laboratory Control Samples, Matrix Spikes and Spike Duplicates**

**(E) POLYNUCLEAR AROMATIC HYDROCARBONS BY GAS CHROMATOGRAPHIC METHODS 610 and 8100**

COMPOUNDS	Water Methods (EPA 8160/8100)	Water Accuracy %R	Water Precision RPD	Soil Methods (SW846)	Soil Accuracy %R	Soil Precision RPD
Naphthalene	610, 8100	56 - 108	0 - 15	8100	34 - 138	0 - 25
Acenaphthylene	610, 8100	65 - 115	0 - 11	8100	43 - 134	0 - 26
Acenaphthene	610, 8100	68 - 114	0 - 10	8100	48 - 133	0 - 25
Fluorene	610, 8100	73 - 117	0 - 11	8100	44 - 142	0 - 24
Phenanthrene	610, 8100	74 - 117	0 - 14	8100	49 - 141	0 - 26
Anthracene	610, 8100	75 - 122	0 - 17	8100	47 - 145	0 - 28
Fluoranthene	610, 8100	79 - 117	0 - 13	8100	51 - 149	0 - 22
Pyrene	610, 8100	77 - 119	0 - 12	8100	50 - 148	0 - 22
Benzo(a)anthracene	610, 8100	79 - 117	0 - 10	8100	49 - 151	0 - 29
Chrysene	610, 8100	74 - 123	0 - 9	8100	50 - 152	0 - 29
Benzo(b)fluoranthene	610, 8100	72 - 119	0 - 15	8100	45 - 157	0 - 30
Benzo(k)fluoranthene	610, 8100	72 - 125	0 - 17	8100	51 - 144	0 - 31
Benzo(a)pyrene	610, 8100	74 - 120	0 - 12	8100	49 - 149	0 - 30
Indeno(1,2,3-cd)pyrene	610, 8100	65 - 128	0 - 11	8100	50 - 153	0 - 30
Dibenzo(a,h)anthracene	610, 8100	69 - 126	0 - 14	8100	46 - 153	0 - 30
Benzo(ghi)perylene	610, 8100	65 - 126	0 - 16	8100	54 - 142	0 - 21

**(F) ORGANOCHLORINE PESTICIDES and POLYCHLORINATED BIPHENYLS BY GAS CHROMATOGRAPHIC METHODS 608 and 8081**

COMPOUNDS	Water Methods (EPA 8160/8100)	Water Accuracy %R	Water Precision RPD	Soil Methods (SW846)	Soil Accuracy %R	Soil Precision RPD
Aldrin	608/8081	40 - 120	0 - 20	8081	34 - 132	0 - 43
gamma-BHC (Lindane)	608/8081	56 - 123	0 - 15	8081	46 - 127	0 - 50
4,4'-DDT	608/8081	38 - 127	0 - 27	8081	23 - 134	0 - 50
Dieldrin	608/8081	52 - 126	0 - 18	8081	31 - 134	0 - 38
Endrin	608/8081	56 - 121	0 - 21	8081	42 - 139	0 - 45
Heptachlor	608/8081	40 - 131	0 - 20	8081	35 - 130	0 - 31
Aroclor 1016	608/8081	50 - 150	0 - 50	8081	50 - 150	0 - 50
Aroclor 1221	608/8081	50 - 150	0 - 50	8081	50 - 150	0 - 50
Aroclor 1232	608/8081	50 - 150	0 - 50	8081	50 - 150	0 - 50
Aroclor 1242	608/8081	50 - 150	0 - 50	8081	50 - 150	0 - 50
Aroclor 1248	608/8081	50 - 150	0 - 50	8081	50 - 150	0 - 50
Aroclor 1254	608/8081	50 - 150	0 - 50	8081	50 - 150	0 - 50
Aroclor 1260	608/8081	50 - 150	0 - 50	8081	50 - 150	0 - 50

**TABLE 8.**  
**CALIBRATION AND SYSTEM PERFORMANCE CHECK CRITERIA FOR SW846 METHOD 8270**

**Calibration Check Compounds (CCC)**

SEMI-VOLATILES	Recommended %RSD for Initial Calibration	Maximum %RSD for Initial Calibration	Maximum % Drift for Continuing Calibration Check
Phenol	15 %	30 %	20 %
1,4-Dichlorobenzene	15 %	30 %	20 %
2-Nitrophenol	15 %	30 %	20 %
2,4-Dichlorophenol	15 %	30 %	20 %
Hexachlorobutadiene	15 %	30 %	20 %
4-Chloro-3-methylphenol	15 %	30 %	20 %
2,4,6-Trichlorophenol	15 %	30 %	20 %
Acenaphthene	15 %	30 %	20 %
N-Nitrosodiphenylamine	15 %	30 %	20 %
Pentachlorophenol	15 %	30 %	20 %
Fluoranthene	15 %	30 %	20 %
Di-n-octylphthalate	15 %	30 %	20 %
Benzo (a) pyrene	15 %	30 %	20 %

**System Performance Check Compounds (SPCC)**

SEMI-VOLATILES	Minimum Response Factor for Initial Calibration	Minimum Response Factor for Continuing Calibration
N-Nitroso-di-propylamine	0.05	0.05
Hexachlorocyclopentadiene	0.05	0.05
2,4-Dinitrophenol	0.05	0.05
4-Nitrophenol	0.05	0.05

**TABLE 9.**  
**DATA REPORTS AND SIGNIFICANT FIGURES**

Data reporting follows a general rule of three significant figures when possible. Each method and instrument; however, has a lower limit of measurement which is often less than three significant figures. The table below illustrates how significant figures for each method are determined and reported. Each "#" sign represents a significant figure and each zero is a place holder or non-significant figure. When rounding numerical data to the appropriate number of significant figures the following rules apply :

1. When the number next beyond the last place to be retained is less than 5, the number in the place retained is left unchanged. *Example : 12.34 rounds to three significant figures as 12.3.*
2. When the number next beyond the last place to be retained is greater than 5, the number in the place retained is rounded to the next higher number. *Example : 12.36 rounds to three significant figures as 12.4.*
3. When the number next beyond the last place to be retained is 5, the number in the place retained is rounded to the nearest even number. *Example : 12.35 rounds to three significant figures as 12.4 and 12.45 rounds to 12.4.*

METHOD	Units	Range 1.0 - 10.0	Range 10.0 - 100	Range 100 - 1,000	Range 1,000 - 10,000	Range 10,000 - 100,000
EPA 602, SW846 8020	ug/L	##	##.#	###	###0	###00
SW846 8020	ug/Kg	##	##.#	###	###0	###00
SW846 8015	ug/L	##	##.#	###	###0	###00
SW846 8015	mg/Kg	##	##.#	###	###0	###00
EPA 418.1	mg/L	##	##.#	###	###0	###00
EPA 418.1	mg/Kg	##	##.#	###	###0	###00
EPA 624, SW846 8240	ug/L	##	##.#	###	###0	###00
EPA 524.2	ug/L	##	##.#	###	###0	###00
SW846 8240, 8260	ug/Kg	##	##.#	###	###0	###00
EPA 610	ug/L	##	##.#	###	###0	###00
EPA 625, 8270	ug/L	##	##.#	###	###0	###00
EPA 200.7, SW846 6010	mg/L	##	##.#	###	###0	###00
EPA 200.8, SW846 6020	ug/L	##	##.#	###	###0	###00
SW846 6020	mg/Kg	##	##.#	###	###0	###00
EPA 245.1, SW846 7470	mg/L	##	##	###	###	###00
EPA 245.5, SW846 7471	mg/Kg	##	##.#	###	###0	###00

METHOD	Units	Range 0.01 - 0.10	Range 0.1 - 10.0	Range 10.0 - 100	Range 100 - 1,000	Range 1,000 - 10,000
SW846 8100	ug/L	0.0#	##	###	###	###0
SW846 8270	mg/Kg	0.0#	##	###	###	###0
SW846 6010 (TCLP)	mg/L	0.0#	##	###	###	###0

TABLE 10.  
SURROGATE RECOVERIES FOR GC METHODS

METHOD 602 Surrogates	Acceptable Range for Water
Fluorobenzene	73 - 122
Trifluorotoluene	72 - 123

METHOD 608 Surrogates	Acceptable Range for Water
2,3,7,8-Tetrachloro-o-xylene	39 - 123
Decachlorobiphenyl	7 - 156

METHOD 8020 Surrogates	Acceptable Range for Water	Acceptable Range for Soil	Acceptable Range for High-Level Soil
Fluorobenzene	75 - 117	51 - 126	74 - 124
Trifluorotoluene	67 - 125	36 - 133	79 - 117

METHOD 8080/8081 Surrogates	Acceptable Range for Water	Acceptable Range for Soil
2,3,7,8-Tetrachloro-o-xylene	39 - 123	25 - 143
Decachlorobiphenyl	7 - 156	22 - 103

METHOD 8100 Surrogates	Acceptable Range for Water	Acceptable Range for Soil
2-Fluorobiphenyl	66 - 118	70 - 105
ortho-Terphenyl	72 - 122	72 - 114

\* Indicates an interim limit.

METHOD 8121 Surrogates	Acceptable Range for Water*	Acceptable Range for Soil*
1,4-Dichloronaphthalene	20 - 150	10 - 150

\* Indicates an interim limit.

TABLE 11.  
SURROGATE RECOVERIES FOR GC/MS METHODS

METHOD 624 Surrogates	Acceptable Range
1,2-Dichloroethane d4	84 - 123
Toluene d8	91 - 117
4-Bromofluorobenzene	85 - 111
Dibromofluoromethane	88 - 110

METHOD 625 Surrogates	Acceptable Range
2-Fluorophenol	21 - 110
Phenol d5	10 - 110
2,4,6-Tribromophenol	10 - 123
Nitrobenzene d5	35 - 114
2-Fluorobiphenyl	43 - 116
Terphenyl d14	33 - 141

METHOD 8240/8260 Surrogates	Acceptable Range for Water	Acceptable Range for Soil	Acceptable Range for High Level Soil
1,2-Dichloroethane d4	84 - 123	91 - 126	59 - 141
Toluene d8	91 - 117	66 - 136	56 - 152
4-Bromofluorobenzene	85 - 111	67 - 123	48 - 152
Dibromofluoromethane	88 - 110	95 - 104	82 - 118

METHOD 8270 Surrogates	Acceptable Range for Water	Acceptable Range for Soil
2-Fluorophenol	21 - 110	24 - 112
Phenol d5	10 - 110	25 - 121
2,4,6-Tribromophenol	10 - 123	19 - 122
2-Chlorophenol d4	33 - 110*	20 - 130*
1,2 - Dichlorobenzene d4	16 - 110*	20 - 130*
Nitrobenzene d5	35 - 114	23 - 120
2-Fluorobiphenyl	43 - 116	30 - 115
Terphenyl d14	33 - 141	18 - 137

\* Advisory limits

TABLE 12.  
EPA METHOD 624  
QC Acceptance Criteria and Detection Limit Summary

COMPOUNDS	Accuracy %R	Precision %RD	Completeness %	MRL (ug/L)	MDL (ug/L)
Chloromethane	D - 273	0 - 20	95	5.0	0.24
Vinyl chloride	D - 251	0 - 20	95	5.0	0.28
Bromomethane	D - 242	0 - 20	95	5.0	0.35
Chloroethane	14 - 230	0 - 20	95	5.0	0.24
Trichlorofluoromethane	17 - 181	0 - 20	95	5.0	0.19
1,1-Dichloroethene	D - 234	0 - 20	95	5.0	0.18
Methylene chloride	D - 221	0 - 20	95	5.0	0.41
trans-1,2-Dichloroethene	54 - 156	0 - 20	95	5.0	0.28
1,1-Dichloroethane	59 - 155	0 - 20	95	5.0	0.22
Chloroform	51 - 138	0 - 20	95	5.0	0.26
1,1,1-Trichloroethane	52 - 162	0 - 20	95	5.0	0.19
Carbon tetrachloride	70 - 140	0 - 20	95	5.0	0.12
Benzene	37 - 151	0 - 20	95	5.0	0.19
1,2-Dichloroethane	49 - 155	0 - 20	95	5.0	0.24
Trichloroethene	71 - 157	0 - 20	95	5.0	0.17
1,2-Dichloropropane	D - 210	0 - 20	95	5.0	0.18
Bromodichloromethane	35 - 155	0 - 20	95	5.0	0.17
2-Chloroethylvinyl ether	D - 305	0 - 20	95	5.0	0.10
cis-1,3-Dichloropropene	D - 227	0 - 20	95	5.0	0.24
Toluene	47 - 150	0 - 20	95	5.0	0.17
trans-1,3-Dichloropropene	17 - 183	0 - 20	95	5.0	0.28
1,1,2-Trichloroethane	52 - 150	0 - 20	95	5.0	0.16
Tetrachloroethene	64 - 148	0 - 20	95	5.0	0.18
Dibromochloromethane	53 - 149	0 - 20	95	5.0	0.12
Chlorobenzene	37 - 160	0 - 20	95	5.0	0.24
Ethylbenzene	37-162	0 - 20	95	5.0	0.24
Bromoform	45 - 169	0 - 20	95	5.0	0.17
1,1,2,2-Tetrachloroethane	46 - 157	0 - 20	95	5.0	0.23
1,3-Dichlorobenzene	59 - 156	0 - 20	95	5.0	0.62
1,4-Dichlorobenzene	18 - 190	0 - 20	95	5.0	0.45
1,2-Dichlorobenzene	18 - 190	0 - 20	95	5.0	0.37
Xylenes (total)	40 - 160	0 - 20	95	5.0	0.17

nd - not determined

TABLE 13.  
EPA METHOD SW846 8260  
QC Acceptance Criteria and Detection Limit Summary

COMPOUND	Accuracy	Precision	Completeness	Soil MRL	Water MRL	Soil MDL	Water MDL
DICHLORODIFLUOROMETHANE	40 - 160	0 - 30	95	5.0	5.0	0.87	0.19
CHLOROMETHANE	D - 273	0 - 30	95	5.0	5.0	0.68	0.24
VINYL CHLORIDE	D - 251	0 - 30	95	5.0	5.0	0.53	0.28
BROMOMETHANE	D - 242	0 - 30	95	5.0	5.0	0.33	0.35
CHLOROETHANE	14 - 230	0 - 30	95	5.0	5.0	0.47	0.24
TRICHLOROFLUOROMETHANE	17 - 181	0 - 30	95	5.0	5.0	0.87	0.19
1,1-DICHLOROETHENE	D - 234	0 - 30	95	5.0	5.0	0.64	0.18
ACETONE	40 - 160	0 - 30	95	25.0	25.0	3.06	0.75
CARBON DISULFIDE	40 - 160	0 - 30	95	5.0	5.0	0.65	0.20
METHYLENE CHLORIDE	D - 221	0 - 30	95	5.0	5.0	0.31	0.41
TRANS-1,2-DICHLOROETHENE	54 - 156	0 - 30	95	5.0	5.0	0.54	0.28
1,1-DICHLOROETHANE	59 - 155	0 - 30	95	5.0	5.0	0.31	0.22
VINYL ACETATE	40 - 160	0 - 30	95	25.0	25.0	0.53	0.19
CIS-1,2-DICHLOROETHENE	40 - 160	0 - 30	95	5.0	5.0	0.44	0.31
2-BUTANONE	40 - 160	0 - 30	95	25.0	25.0	1.27	0.95
CHLOROFORM	51 - 138	0 - 30	95	5.0	5.0	0.69	0.26
1,1,1-TRICHLOROETHANE	52 - 162	0 - 30	95	5.0	5.0	0.67	0.19
CARBON TETRACHLORIDE	70 - 140	0 - 30	95	5.0	5.0	0.76	0.12
BENZENE	37 - 151	0 - 30	95	5.0	5.0	0.43	0.19
1,2-DICHLOROETHANE	49 - 155	0 - 30	95	5.0	5.0	0.37	0.24
TRICHLOROETHENE	71 - 157	0 - 30	95	5.0	5.0	0.66	0.17
1,2-DICHLOROPROPANE	D - 210	0 - 30	95	5.0	5.0	0.48	0.18
BROMODICHLOROMETHANE	35 - 155	0 - 30	95	5.0	5.0	0.38	0.17
CIS-1,3-DICHLOROPROPENE	D - 227	0 - 30	95	5.0	5.0	0.64	0.24
4-METHYL-2-PENTANONE	40 - 160	0 - 30	95	25.0	25.0	2.36	0.24
TOLUENE	47 - 150	0 - 30	95	5.0	5.0	0.51	0.17
TRANS-1,3-DICHLOROPROPENE	17 - 183	0 - 30	95	5.0	5.0	0.61	0.28
1,1,2-TRICHLOROETHANE	52 - 150	0 - 30	95	5.0	5.0	0.46	0.16
TETRACHLOROETHENE	64 - 148	0 - 30	95	5.0	5.0	0.66	0.18
2-HEXANONE	40 - 160	0 - 30	95	25.0	25.0	4.91	0.37
DIBROMOCHLOROMETHANE	53 - 149	0 - 30	95	5.0	5.0	0.58	0.12
CHLOROBENZENE	37 - 160	0 - 30	95	5.0	5.0	0.74	0.24
ETHYLBENZENE	37 - 162	0 - 30	95	5.0	5.0	0.86	0.24
M&P-XYLENE	40 - 160	0 - 30	95	5.0	5.0	0.64	0.34
O-XYLENE	40 - 160	0 - 30	95	5.0	5.0	0.84	0.17
STYRENE	54 - 148	0 - 30	95	5.0	5.0	0.96	0.21
BROMOFORM	45 - 169	0 - 30	95	5.0	5.0	0.86	0.17
1,1,2,2-TETRACHLOROETHANE	46 - 157	0 - 30	95	5.0	5.0	0.76	0.23
2-CHLOROETHYL VINYL ETHER	40 - 160	0 - 30	95	5.0	5.0	0.99	0.10
1,3-DICHLOROBENZENE	59 - 156	0 - 30	95	5.0	5.0	0.73	0.62
1,4-DICHLOROBENZENE	18 - 190	0 - 30	95	5.0	5.0	0.77	0.45
1,2-DICHLOROBENZENE	18 - 190	0 - 30	95	5.0	5.0	0.83	0.37
2,2-DICHLOROPROPANE	40 - 160	0 - 30	95	5.0	5.0	0.70	0.47
BROMOCHLOROMETHANE	17 - 121	0 - 30	95	5.0	5.0	0.24	0.14
DIBROMOMETHANE	D - 152	0 - 30	95	5.0	5.0	0.48	0.62
1,3-DICHLOROPROPANE	D - 123	0 - 30	95	5.0	5.0	0.42	0.36
1,2-DIBROMOETHANE	40 - 160	0 - 30	95	5.0	5.0	0.66	0.80
1,1,1,2-TETRACHLOROETHANE	40 - 160	0 - 30	95	5.0	5.0	0.61	0.37
ISOPROPYLBENZENE	32 - 136	0 - 30	95	5.0	5.0	0.90	0.56
1,2,3-TRICHLOROPROPANE	40 - 160	0 - 30	95	5.0	5.0	0.83	0.66
n-PROPYLBENZENE	40 - 160	0 - 30	95	5.0	5.0	0.43	0.66
BROMOBENZENE	D - 145	0 - 30	95	5.0	5.0	0.52	0.36
1,3,5-TRIMETHYLBENZENE	40 - 160	0 - 30	95	5.0	5.0	0.44	0.48
2-CHLOROTOLUENE	40 - 160	0 - 30	95	5.0	5.0	0.55	0.51
4-CHLOROTOLUENE	40 - 160	0 - 30	95	5.0	5.0	0.56	0.53
i-BUTYLBENZENE	40 - 160	0 - 30	95	5.0	5.0	0.45	0.60
1,2,4-TRIMETHYLBENZENE	40 - 160	0 - 30	95	5.0	5.0	0.60	0.42
sec-BUTYLBENZENE	40 - 160	0 - 30	95	5.0	5.0	0.45	0.55
4-ISOPROPYLTOLUENE	40 - 160	0 - 30	95	5.0	5.0	0.50	0.55
n-BUTYLBENZENE	40 - 160	0 - 30	95	5.0	5.0	0.49	0.62
1,2-DIBROMO-3-CHLOROPROPANE	40 - 160	0 - 30	95	5.0	5.0	0.49	0.65
1,2,4-TRICHLOROBENZENE	40 - 160	0 - 30	95	5.0	5.0	0.74	0.63
HEXACHLOROBTADIENE	40 - 160	0 - 30	95	5.0	5.0	0.62	0.31
NAPHTHALENE	40 - 160	0 - 30	95	5.0	5.0	0.32	0.89
1,2,3-TRICHLOROBENZENE	40 - 160	0 - 30	95	5.0	5.0	0.98	0.80
1,1-DICHLOROPROPENE	40 - 160	0 - 30	95	5.0	5.0	0.50	0.50
METHYL-t-BUTYL ETHER	40 - 160	0 - 30	95	5.0	5.0	0.78	0.25
n-HEXANE	40 - 160	0 - 30	95	5.0	5.0	0.69	0.85



TABLE 14.  
EPA METHOD 625  
QC Acceptance Criteria and Detection Limit Summary

COMPOUNDS	Accuracy %R	Precision RPD	Completeness %	MRL (ug/L)	MDL (ug/L)
N-Nitrosodimethylamine	10 - 150	0 - 40	95	25.0	3.9
Phenol	5 - 112	0 - 40	95	5.0	3.9
2-Chlorophenol	23 - 134	0 - 40	95	5.0	3.9
bis(2-Chloroethyl)ether	12 - 158	0 - 40	95	5.0	3.1
1,3-Dichlorobenzene	D - 172	0 - 40	95	5.0	3.7
1,4-Dichlorobenzene	20 - 124	0 - 40	95	5.0	3.6
1,2-Dichlorobenzene	32 - 129	0 - 40	95	5.0	2.9
bis(2-Chloroisopropyl)ether	36 - 166	0 - 40	95	5.0	4.4
Hexachloroethane	40 - 112	0 - 40	95	5.0	4.6
N-Nitroso-di-n-propylamine	D - 230	0 - 40	95	25.0	4.5
Nitrobenzene	35 - 180	0 - 40	95	5.0	4.7
Isophorone	21 - 196	0 - 40	95	5.0	4.8
2-Nitrophenol	29 - 182	0 - 40	95	5.0	4.6
2,4-Dimethylphenol	32 - 119	0 - 40	95	5.0	3.8
bis(2-Chloroethoxy)methane	33 - 184	0 - 40	95	5.0	4.3
2,4-Dichlorophenol	39 - 135	0 - 40	95	5.0	4.7
1,2,4-Trichlorobenzene	44 - 142	0 - 40	95	5.0	3.4
Naphthalene	21 - 133	0 - 40	95	5.0	3.6
Hexachlorobutadiene	24 - 116	0 - 40	95	5.0	3.9
4-Chloro-3-methylphenol	22 - 147	0 - 40	95	5.0	3.6
Hexachlorocyclopentadiene	10 - 150	0 - 40	95	5.0	4.9
2,4,6-Trichlorophenol	37 - 144	0 - 40	95	5.0	4.4
2-Chloronaphthalene	60 - 118	0 - 40	95	5.0	4.6
Acenaphthylene	33 - 145	0 - 40	95	5.0	4.4
Dimethyl phthalate	D - 112	0 - 40	95	5.0	2.7
2,6-Dinitrotoluene	50 - 158	0 - 40	95	5.0	4.2
Acenaphthene	47 - 145	0 - 40	95	5.0	4.1
2,4-Dinitrophenol	D - 191	0 - 40	95	25.0	4.4
4-Nitrophenol	D - 132	0 - 40	95	5.0	2.7
2,4-Dinitrotoluene	39 - 139	0 - 40	95	5.0	2.8
Diethyl phthalate	D - 114	0 - 40	95	5.0	3.9
Fluorene	59 - 121	0 - 40	95	5.0	3.1
4-Chlorophenylphenyl ether	25 - 158	0 - 40	95	5.0	3.1
2-Methyl-4,6-dinitrophenol	D - 181	0 - 40	95	25.0	3.5
N-Nitrosodiphenylamine	10 - 150	0 - 40	95	5.0	1.4
Azobenzene	10 - 150	0 - 40	95	5.0	33.5
4-Bromophenylphenyl ether	53 - 127	0 - 40	95	5.0	2.2
Hexachlorobenzene	D - 152	0 - 40	95	5.0	1.8
Pentachlorophenol	14 - 176	0 - 40	95	5.0	1.8
Phenanthrene	54 - 120	0 - 40	95	5.0	2.3
Anthracene	27 - 133	0 - 40	95	5.0	2.5
Di-n-butyl phthalate	1 - 118	0 - 40	95	5.0	1.9
Fluoranthene	26 - 137	0 - 40	95	5.0	1.2
Benzidine	10 - 150	0 - 40	95	25.0	6.2
Pyrene	52 - 115	0 - 40	95	5.0	0.7
Butyl benzyl phthalate	D - 152	0 - 40	95	5.0	3.4
Benzo(a)anthracene	33 - 143	0 - 40	95	5.0	4.3
3,3'-Dichlorobenzidine	D - 262	0 - 40	95	25.0	2.7
Chrysene	17 - 168	0 - 40	95	5.0	1.2
bis(2-Ethylhexyl) phthalate	8 - 158	0 - 40	95	5.0	2.5
Di-n-octyl phthalate	4 - 146	0 - 40	95	5.0	3.7
Benzo(b)fluoranthene	24 - 159	0 - 40	95	5.0	1.6
Benzo(k)fluoranthene	11 - 162	0 - 40	95	5.0	2.7
Benzo(a)pyrene	17 - 163	0 - 40	95	5.0	1.1
Indeno(1,2,3-cd)pyrene	D - 171	0 - 40	95	5.0	1.4
Dibenzo(a,h)anthracene	D - 227	0 - 40	95	5.0	0.8
Benzo(g,h,i)perylene	D - 219	0 - 40	95	5.0	0.6

nd- not determined

TABLE 15.  
EPA METHOD 8270  
QC Acceptance Criteria and Detection Limit Summary

COMPOUNDS	Accuracy %R	Precision RPD	Completeness %R	Water MRL (ug/L)	Soil MRL (mg/kg)	Water MDL (ug/L)	Soil MDL (ug/kg)
N-Nitrosodimethylamine	10 - 150	0 - 40	95	25.0	1.65	3.9	0.05
Phenol	5 - 112	0 - 40	95	5.0	0.330	3.9	0.05
2-Chlorophenol	23 - 134	0 - 40	95	5.0	0.330	3.9	0.07
bis(2-Chloroethyl)ether	12 - 158	0 - 40	95	5.0	0.330	3.1	0.07
1,3-Dichlorobenzene	D - 172	0 - 40	95	5.0	0.330	3.7	0.09
1,4-Dichlorobenzene	20 - 124	0 - 40	95	5.0	0.330	3.6	0.09
1,2-Dichlorobenzene	32 - 129	0 - 40	95	5.0	0.330	2.9	0.07
Benzyl alcohol	10 - 150	0 - 40	95	5.0	0.330	3.9	0.08
2-Methylphenol	10 - 150	0 - 40	95	5.0	0.330	4.9	0.06
bis(2-Chloroisopropyl)ether	36 - 166	0 - 40	95	5.0	0.330	4.4	0.06
4-Methylphenol	10 - 150	0 - 40	95	5.0	0.330	4.9	0.05
Hexachloroethane	40 - 112	0 - 40	95	5.0	0.330	4.6	0.07
N-Nitroso-di-n-propylamine	D - 230	0 - 40	95	25.0	1.65	4.5	0.10
Nitrobenzene	35 - 180	0 - 40	95	5.0	0.330	4.7	0.05
Isophorone	21 - 196	0 - 40	95	5.0	0.330	4.8	0.08
2-Nitrophenol	29 - 182	0 - 40	95	5.0	0.330	4.6	0.10
2,4-Dimethylphenol	32 - 119	0 - 40	95	5.0	0.330	3.8	0.06
bis(2-Chloroethoxy)methane	33 - 184	0 - 40	95	5.0	0.330	4.3	0.09
2,4-Dichlorophenol	39 - 135	0 - 40	95	5.0	0.330	4.7	0.06
1,2,4-Trichlorobenzene	44 - 142	0 - 40	95	5.0	0.330	3.4	0.05
Naphthalene	21 - 133	0 - 40	95	5.0	0.330	3.6	0.07
4-Chloroaniline	10 - 150	0 - 49	95	5.0	0.330	3.9	0.10
Hexachlorobutadiene	24 - 116	0 - 40	95	5.0	0.330	3.9	0.08
4-Chloro-3-methylphenol	22 - 147	0 - 40	95	5.0	0.330	3.6	0.07
2-Methylnaphthalene	10 - 150	0 - 40	95	5.0	0.330	4.0	0.04
Hexachlorocyclopentadiene	10 - 150	0 - 40	95	5.0	0.330	4.9	0.04
2,4,5-Trichlorophenol	10 - 150	0 - 40	95	5.0	0.330	3.4	0.08
2,4,6-Trichlorophenol	37 - 144	0 - 40	95	5.0	0.330	4.4	0.09
2-Chloronaphthalene	60 - 118	0 - 40	95	5.0	0.330	4.6	0.06
2-Nitroaniline	10 - 150	0 - 40	95	5.0	0.330	3.1	0.05
Acenaphthylene	33 - 145	0 - 40	95	5.0	0.330	4.4	0.05
Dimethyl phthalate	D - 112	0 - 40	95	5.0	0.330	2.7	0.05
2,6-Dinitrotoluene	50 - 158	0 - 40	95	5.0	0.330	4.2	0.05
3-Nitroaniline	10 - 150	0 - 40	95	5.0	0.330	4.3	0.06
Acenaphthene	47 - 145	0 - 40	95	5.0	0.330	4.1	0.05
2,4-Dinitrophenol	D - 191	0 - 40	95	25.0	1.65	4.4	0.02
4-Nitrophenol	D - 132	0 - 40	95	5.0	0.330	2.7	0.11
Dibenzofuran	10 - 150	0 - 40	95	5.0	0.330	3.6	0.05
2,4-Dinitrotoluene	39 - 139	0 - 40	95	5.0	0.330	2.8	0.06
Diethyl phthalate	D - 114	0 - 40	95	5.0	0.330	3.9	0.04
Fluorene	59 - 121	0 - 40	95	5.0	0.330	3.1	0.04
4-Chlorophenylphenyl ether	25 - 158	0 - 40	95	5.0	0.330	3.1	0.04
4-Nitroaniline	10 - 150	0 - 40	95	5.0	0.330	4.2	0.05
2-Methyl-4,6-dinitrophenol	D - 181	0 - 40	95	25.0	1.65	3.5	0.02
N-Nitrosodiphenylamine	10 - 150	0 - 40	95	5.0	0.330	1.4	0.05
Azobenzene	10 - 150	0 - 40	95	5.0	0.330	33.5	0.05
4-Bromophenylphenyl ether	53 - 127	0 - 40	95	5.0	0.330	2.2	0.06
Hexachlorobenzene	D - 152	0 - 40	95	5.0	0.330	1.8	0.06
Pentachlorophenol	14 - 176	0 - 40	95	5.0	0.330	1.8	0.07
Phenanthrene	54 - 120	0 - 40	95	5.0	0.330	2.3	0.07
Anthracene	27 - 133	0 - 40	95	5.0	0.330	2.5	0.05
Carbazole	10 - 150	0 - 40	95	5.0	0.330	1.5	0.04
Di-n-butyl phthalate	1 - 118	0 - 40	95	5.0	0.330	1.9	0.05

nd- not determined

TABLE 15. (cont.)  
EPA METHOD 8270  
QC Acceptance Criteria and Detection Limit Summary

COMPOUNDS	Accuracy %R	Precision RSD %	Completeness %	Water MRL (ug/L)	Soil MRL (mg/Kg)	Water MDL (ug/L)	Soil MDL (ug/Kg)
Fluoranthene	26 - 137	0 - 40	95	5.0	0.330	1.2	0.04
Pyrene	52 - 115	0 - 40	95	5.0	0.330	0.7	0.05
Butyl benzyl phthalate	D - 152	0 - 40	95	5.0	0.330	3.4	0.04
Benzo(a)anthracene	33 - 143	0 - 40	95	5.0	0.330	4.3	0.09
3,3'-Dichlorobenzidine	D - 262	0 - 40	95	25.0	1.65	2.7	0.10
Chrysene	17 - 168	0 - 40	95	5.0	0.330	1.2	0.04
bis(2-Ethylhexyl) phthalate	8 - 158	0 - 40	95	5.0	0.330	2.5	0.03
Di-n-octyl phthalate	4 - 146	0 - 40	95	5.0	0.330	3.7	0.04
Benzo(b)fluoranthene	24 - 159	0 - 40	95	5.0	0.330	1.6	0.07
Benzo(k)fluoranthene	11 - 162	0 - 40	95	5.0	0.330	2.7	0.05
Benzo(a)pyrene	17 - 163	0 - 40	95	5.0	0.330	1.1	0.04
Indeno(1,2,3-cd)pyrene	D - 171	0 - 40	95	5.0	0.330	1.4	0.03
Dibenzo(a,h)anthracene	D - 227	0 - 40	95	5.0	0.330	0.8	0.03
Benzo(g,h,i)perylene	D - 219	0 - 40	95	5.0	0.330	0.6	0.04
Arochlor 1016	10 - 150	0 - 50	95	10.0	0.5	nd	nd
Arochlor 1221	10 - 150	0 - 50	95	10.0	0.5	nd	nd
Arochlor 1232	10 - 150	0 - 50	95	10.0	0.5	nd	nd
Arochlor 1242	10 - 150	0 - 50	95	10.0	0.5	nd	nd
Arochlor 1248	10 - 150	0 - 50	95	10.0	0.5	nd	nd
Arochlor 1254	10 - 150	0 - 50	95	10.0	0.5	nd	nd
Arochlor 1260	D - 164	0 - 50	95	10.0	0.5	nd	nd

nd- not determined

TABLE 16.  
EPA METHOD 524.2  
QC Acceptance Criteria and Detection Limit Summary

Compounds	Accuracy % R	Precision RPD	Completeness	MRL (ug/L)	MDL (ug/L)
Dichlorodifluoromethane	70 - 130	0 - 20	95	0.50	0.18
Chloromethane	70 - 130	0 - 20	95	0.50	0.20
Vinyl chloride	70 - 130	0 - 20	95	0.50	0.16
Bromomethane	70 - 130	0 - 20	95	0.50	0.21
Chloroethane	70 - 130	0 - 20	95	0.50	0.25
Trichlorofluoromethane	70 - 130	0 - 20	95	0.50	0.15
1,1-Dichloroethene	70 - 130	0 - 20	95	0.50	0.12
Methylene chloride	70 - 130	0 - 20	95	0.50*	0.29*
trans-1,2-dichloroethene	70 - 130	0 - 20	95	0.50	0.14
1,1-Dichloroethane	70 - 130	0 - 20	95	0.50	0.14
cis-1,2-Dichloroethene	70 - 130	0 - 20	95	0.50	0.15
2,2-Dichloropropane	70 - 130	0 - 20	95	0.50	0.27
Bromochloromethane	70 - 130	0 - 20	95	0.50	0.25
Chloroform	70 - 130	0 - 20	95	0.50	0.20
1,1,1-Trichloroethane	70 - 130	0 - 20	95	0.50	0.12
Carbon tetrachloride	70 - 130	0 - 20	95	0.50	0.23
1,1-Dichloropropene	70 - 130	0 - 20	95	0.50	0.19
Benzene	70 - 130	0 - 20	95	0.50	0.13
1,2-Dichloroethane	70 - 130	0 - 20	95	0.50	0.18
Trichloroethene	70 - 130	0 - 20	95	0.50	0.14
1,2-Dichloropropane	70 - 130	0 - 20	95	0.50	0.22
Dibromomethane	70 - 130	0 - 20	95	0.50	0.19
Bromodichloromethane	70 - 130	0 - 20	95	0.50	0.12
cis-1,3-Dichloropropene	70 - 130	0 - 20	95	0.50	0.15
Toluene	70 - 130	0 - 20	95	0.50	0.16
trans-1,3-Dichloropropene	70 - 130	0 - 20	95	0.50	0.25
1,1,2-Trichloroethane	70 - 130	0 - 20	95	0.50	0.24
Tetrachloroethene	70 - 130	0 - 20	95	0.50	0.23
1,3-Dichloropropane	70 - 130	0 - 20	95	0.50	0.22
Dibromochloromethane	70 - 130	0 - 20	95	0.50	0.17
1,2-Dibromoethane	70 - 130	0 - 20	95	0.50	0.25
Chlorobenzene	70 - 130	0 - 20	95	0.50	0.15
1,1,1,2-Tetrachloroethane	70 - 130	0 - 20	95	0.50	0.19
Ethylbenzene	70 - 130	0 - 20	95	0.50	0.15
m&p-Xylene	70 - 130	0 - 20	95	0.50	0.11
o-Xylene	70 - 130	0 - 20	95	0.50	0.19
Styrene	70 - 130	0 - 20	95	0.50	0.25
Bromoform	70 - 130	0 - 20	95	0.50	0.19
Isopropylbenzene	70 - 130	0 - 20	95	0.50	0.13
1,1,2,2-Tetrachloroethane	70 - 130	0 - 20	95	0.50	0.18
Bromobenzene	70 - 130	0 - 20	95	0.50	0.13
1,2,3-Trichloropropane	70 - 130	0 - 20	95	0.50	0.09
n-Propylbenzene	70 - 130	0 - 20	95	0.50	0.15
2-Chlorotoluene	70 - 130	0 - 20	95	0.50	0.23
1,3,5-Trimethylbenzene	70 - 130	0 - 20	95	0.50	0.21
4-Chlorotoluene	70 - 130	0 - 20	95	0.50	0.19
tert-Butylbenzene	70 - 130	0 - 20	95	0.50	0.12
1,2,4-Trimethylbenzene	70 - 130	0 - 20	95	0.50	0.23
sec-Butylbenzene	70 - 130	0 - 20	95	0.50	0.14
1,3-Dichlorobenzene	70 - 130	0 - 20	95	0.50	0.25
p-Isopropyltoluene	70 - 130	0 - 20	95	0.50	0.21
1,4-Dichlorobenzene	70 - 130	0 - 20	95	0.50	0.30
n-Butylbenzene	70 - 130	0 - 20	95	0.50	0.25
1,2-Dichlorobenzene	70 - 130	0 - 20	95	0.50	0.30
1,2-Dibromo-3-chloropropane	70 - 130	0 - 20	95	0.50	0.42
1,2,4-Trichlorobenzene	70 - 130	0 - 20	95	0.50	0.35
Hexachlorobutadiene	70 - 130	0 - 20	95	0.50	0.28
Naphthalene	70 - 130	0 - 20	95	0.50	0.29
1,2,3-Trichlorobenzene	70 - 130	0 - 20	95	0.50	0.31

\* Methylene chloride is a common laboratory contaminant, this detection limit value may not be routinely achieved under normal laboratory operations.

TABLE 17.  
AROMATIC VOLATILE ORGANICS BY GC  
(low level method)

COMPOUNDS	Accuracy %R	Precision RPD	Completeness	Water MRL (ug/L)	Soil MRL (ug/Kg)	Water MDL (ug/L)	Soil MDL (ug/Kg)
Benzene	39 - 150	0 - 20	95	0.4	2.0	0.078	0.37
Toluene	46 - 148	0 - 20	95	0.4	2.0	0.292	0.37
Chlorobenzene	55 - 135	0 - 20	95	0.4	2.0	0.095	0.48
Ethylbenzene	32 - 160	0 - 20	95	0.4	2.0	0.074	0.31
m&p-Xylene	50 - 150	0 - 20	95	0.4	2.0	0.135	0.78
o-Xylene	50 - 150	0 - 20	95	0.4	2.0	0.086	0.35
1,3-Dichlorobenzene	50 - 141	0 - 20	95	0.4	2.0	0.107	0.54
1,4-Dichlorobenzene	42 - 143	0 - 20	95	0.4	2.0	0.075	0.38
1,2-Dichlorobenzene	37 - 154	0 - 20	95	0.4	2.0	0.065	0.32

TOTAL PETROLEUM HYDROCARBONS

COMPOUNDS	Water Accuracy %R	Precision RPD	Soil Accuracy %R	Precision RPD	Completeness	Water MRL (mg/L)	Soil MRL (mg/Kg)	Water MDL (mg/L)	Soil MDL (mg/Kg)
TPH IR	81 - 112	0 - 6	82 - 108	0 - 8	95	1.0	4.0	0.07	3.6
TPH GC GRO	71 - 115	0 - 17	50 - 150	0 - 25	95	1.0	4.0	0.015	0.04
TPH GC DRO	48 - 121	0 - 15	84 - 122	0 - 18	95	1.0	4.0	0.8	0.92
Total TPH GC	48 - 121	0 - 15	84 - 122	0 - 18	95	1.0	4.0	0.8	0.92

nd - Not determined.

ORGANOCHLORINE PESTICIDES BY GAS CHROMATOGRAPHY

COMPOUNDS	Accuracy %R	Precision RPD	Completeness	Water MRL (ug/L)	Water MDL (ug/L)	Soil MRL (ug/Kg)	Soil MDL (ug/Kg)
Aldrin	42 - 122	0 - 30	95	0.05	0.0044	0.05	0.95
alpha-BHC	37 - 134	0 - 30	95	0.05	0.0020	0.05	0.86
beta-BHC	17 - 147	0 - 30	95	0.05	0.0027	0.05	1.51
delta-BHC	19 - 140	0 - 30	95	0.05	0.0025	0.05	0.80
gamma-BHC (Lindane)	32 - 127	0 - 30	95	0.05	0.0021	0.05	0.80
4,4'-DDD	31 - 141	0 - 30	95	0.10	0.0081	3.3	2.10
4,4'-DDE	30 - 145	0 - 30	95	0.10	0.0071	3.3	2.42
4,4'-DDT	25 - 160	0 - 30	95	0.10	0.0074	3.3	2.25
Dieldrin	36 - 146	0 - 30	95	0.10	0.0073	3.3	2.09
Endosulfan I	45 - 153	0 - 30	95	0.05	0.0031	1.7	0.81
Endosulfan II	D - 202	0 - 30	95	0.10	0.0083	3.3	2.29
Endosulfan sulfate	26 - 144	0 - 30	95	0.10	0.0080	3.3	2.11
Endrin	30 - 147	0 - 30	95	0.10	0.0077	3.3	2.52
Endrin Aldehyde	25-150*	0 - 30	95	0.10	0.0088	3.3	2.13
Heptachlor	34 - 111	0 - 30	95	0.05	0.0021	1.7	0.99
Heptachlor epoxide	37 - 142	0 - 30	95	0.05	0.0026	1.7	0.39
Methoxychlor	25-150*	0 - 30	95	0.50	0.0193	17	11.5
Toxaphene	41 - 126	0 - 30	95	2.50	0.94	85	5.53
Chlordane	45 - 119	0 - 30	95	2.50	1.77	85	48.8
Aroclor 1016	50 - 114	0 - 30	95	1.5	0.612	33	9.05
Aroclor 1221	15 - 178	0 - 30	95	1.5	0.684	33	9.28
Aroclor 1232	10 - 215	0 - 30	95	1.5	0.632	33	15.1
Aroclor 1242	38 - 150	0 - 30	95	1.5	0.171	33	11.3
Aroclor 1248	38 - 158	0 - 30	95	1.5	0.850	33	9.32
Aroclor 1254	29 - 131	0 - 30	95	1.5	0.498	33	30.2
Aroclor 1260	8 - 127	0 - 30	95	1.5	0.430	33	2.23

**TABLE 18.**  
**METHODS 610 AND 8100**  
**QC Acceptance Limits, Reporting Limits and Detection Limits**

COMPOUNDS	Accuracy %R	Precision RPD	Completeness	Water MRL (ug/L)	Soil MRL (mg/Kg)	Water MDL (ug/L)	Soil MDL (ug/L)
Naphthalene	D - 122	0 - 50	95	1.00	0.33	0.42	0.30
Acenaphthylene	D - 139	0 - 50	95	1.00	0.33	0.65	0.27
Acenaphthene	D - 124	0 - 50	95	1.00	0.33	0.61	0.31
Fluorene	D - 142	0 - 50	95	1.00	0.33	0.71	0.31
Phenanthrene	D - 155	0 - 50	95	1.00	0.33	0.70	0.29
Anthracene	D - 126	0 - 50	95	1.00	0.33	0.76	0.31
Fluoranthene	14 - 123	0 - 50	95	1.00	0.33	0.67	0.24
Pyrene	D - 140	0 - 50	95	1.00	0.33	0.65	0.21
Benzo(a)anthracene	12 - 135	0 - 50	95	1.00	0.33	0.57	0.23
Chrysene	D - 199	0 - 50	95	1.00	0.33	0.59	0.26
Benzo(b)fluoranthene	6 - 150	0 - 50	95	1.00	0.33	0.48	0.27
Benzo(k)fluoranthene	D - 159	0 - 50	95	1.00	0.33	0.62	0.22
Benzo(a)pyrene	D - 128	0 - 50	95	1.00	0.33	0.52	0.23
Indeno(1,2,3-cd)pyrene	D - 116	0 - 50	95	1.00	0.33	0.79	0.18
Dibenzo(a,h)anthracene	D - 110	0 - 50	95	1.00	0.33	0.64	0.16
Benzo(ghi)perylene	D - 116	0 - 50	95	1.00	0.33	0.68	0.19

D = Detected; result must be greater than zero.

\* - Accuracy and precision are the published acceptance criteria from EPA method 610 and 40 CFR part 136.

\*\* - Detection limits listed were determined from laboratory data using a flame ionization detector.

**METHOD 8121**  
**QC Acceptance Limits, Reporting Limits and Detection Limits**

COMPOUNDS	Completeness %	% Recovery Acceptance Range for Water	RPD limits for Water	MRL Water (ug/L)	MDL Water (ug/ml)	% Recovery Acceptance Range for Soil	RPD limits for Soil	MRL Soil (ug/Kg)	MDL Soil (ug/Kg)
Benzal chloride	95	5 - 150	0 - 30	0.20	0.09	5 - 150	0 - 50	20.0	6.71
Benzotrichloride	95	5 - 150	0 - 30	0.20	0.07	5 - 150	0 - 50	20.0	4.30
Benzyl chloride	95	5 - 150	0 - 30	0.50	0.33	5 - 150	0 - 50	50.0	18.7
2-Chloronaphthalene	95	9 - 148	0 - 30	1.00	0.57	9 - 148	0 - 50	50.0	28.8
1,2-Dichlorobenzene	95	9 - 160	0 - 30	0.50	0.13	9 - 160	0 - 50	10.0	1.36
1,3-Dichlorobenzene	95	D - 150	0 - 30	0.50	0.13	D - 150	0 - 50	10.0	1.36
1,4-Dichlorobenzene	95	13 - 137	0 - 30	0.50	0.13	13 - 137	0 - 50	10.0	1.36
Hexachlorobenzene	95	15 - 159	0 - 30	0.20	0.06	15 - 159	0 - 50	10.0	1.84
Hexachlorobutadiene	95	D - 139	0 - 30	0.50	0.18	D - 139	0 - 50	10.0	2.50
alpha-BHC	95	5 - 150	0 - 30	0.20	0.07	5 - 150	0 - 50	10.0	1.84
beta-BHC	95	5 - 150	0 - 30	1.00	0.42	5 - 150	0 - 50	50.0	13.9
gamma-BHC	95	5 - 150	0 - 30	0.20	0.07	5 - 150	0 - 50	10.0	1.84
delta-BHC	95	5 - 150	0 - 30	1.00	0.42	5 - 150	0 - 50	50.0	13.9
Hexachlorocyclopentadiene	95	D - 111	0 - 30	0.50	0.18	D - 111	0 - 50	10.0	2.37
Hexachloroethane	95	8 - 139	0 - 30	0.50	0.13	8 - 139	0 - 50	10.0	1.36
Pentachlorobenzene	95	5 - 150	0 - 30	0.20	0.06	5 - 150	0 - 50	10.0	1.50
1,2,3,4-Tetrachlorobenzene	95	5 - 150	0 - 30	0.50	0.13	5 - 150	0 - 50	10.0	3.82
1,2,3,5-Tetrachlorobenzene	95	5 - 150	0 - 30	0.50	0.17	5 - 150	0 - 50	20.0	6.00
1,2,4,5-Tetrachlorobenzene	95	5 - 150	0 - 30	0.50	0.17	5 - 150	0 - 50	20.0	6.00
1,2,4-Trichlorobenzene	95	5 - 149	0 - 30	0.20	0.09	5 - 149	0 - 50	20.0	6.71
1,2,3-Trichlorobenzene	95	5 - 149	0 - 30	0.50	0.13	5 - 149	0 - 50	10.0	4.11
1,3,5-Trichlorobenzene	95	5 - 149	0 - 30	0.50	0.28	5 - 149	0 - 50	50.0	12.6

**TABLE 19.**  
**METALS BY INDUCTIVELY COUPLED PLASMA ATOMIC EMISSION SPECTROMETRY (ICP-AES)**  
**WATER EPA METHOD 200.7 AND SW846 METHOD 6010**  
**SOIL/SEDIMENT SW846 METHOD 6010**

Element	Water Accuracy %R	Precision RPD	Soil Accuracy %R	Precision RPD	Completeness %	Water MRL (mg/L)	Soil MRL (mg/Kg)	Water MDL (mg/L)	Soil MDL (mg/Kg)
Aluminum	75 - 125	0 - 20	75 - 125	0 - 20	95	0.200	10.00	0.014	1.62
Antimony	75 - 125	0 - 20	75 - 125	0 - 20	95	0.060	5.00	0.043	3.84
Arsenic	69 - 116	0 - 20	58 - 127	0 - 20	95	50	5.00	0.018	4.71
Barium	67 - 118	0 - 20	62 - 129	0 - 20	95	0.005	0.50	0.0006	0.11
Beryllium	75 - 125	0 - 20	75 - 125	0 - 20	95	0.005	0.50	0.011	0.11
Cadmium	67 - 115	0 - 20	67 - 131	0 - 20	95	0.005	0.50	0.0017	0.18
Calcium	75 - 125	0 - 20	75 - 125	0 - 20	95	2.00	250	0.028	6.94
Chromium	67 - 112	0 - 20	61 - 115	0 - 20	95	0.005	0.50	0.0015	0.09
Cobalt	75 - 125	0 - 20	75 - 125	0 - 20	95	0.005	0.50	0.0008	0.16
Copper	75 - 125	0 - 20	75 - 125	0 - 20	95	0.010	1.00	0.0012	0.75
Iron	75 - 125	0 - 20	75 - 125	0 - 20	95	0.100	5.0	0.004	2.39
Lead	68 - 111	0 - 20	60 - 118	0 - 20	95	0.005	1.00	0.004	0.64
Lithium	75 - 125	0 - 20	75 - 125	0 - 20	95	0.005	0.50	0.0002	0.11
Magnesium	75 - 125	0 - 20	75 - 125	0 - 20	95	5.00	250	0.018	5.59
Manganese	75 - 125	0 - 20	75 - 125	0 - 20	95	0.005	0.25	0.7	0.32
Molybdenum	75 - 125	0 - 20	75 - 125	0 - 20	95	0.005	1.00	0.002	0.47
Nickel	75 - 125	0 - 20	75 - 125	0 - 20	95	0.005	0.25	0.004	0.37
Potassium	75 - 125	0 - 20	75 - 125	0 - 20	95	5.00	5.0	0.027	4.65
Selenium	70 - 123	0 - 20	67 - 140	0 - 20	95	0.050	2.50	0.018	3.91
Silver	61 - 123	0 - 20	68 - 130	0 - 20	95	0.005	0.25	0.0009	0.16
Sodium	75 - 125	0 - 20	75 - 125	0 - 20	95	5.00	1.0	0.044	8.83
Thallium	75 - 125	0 - 20	75 - 125	0 - 20	95	0.050	2.50	0.019	2.32
Vanadium	75 - 125	0 - 20	75 - 125	0 - 20	95	0.005	0.25	0.001	0.44
Zinc	75 - 125	0 - 20	75 - 125	0 - 20	95	0.005	1.0	0.0009	1.75

**note-** The estimated detection limits as shown are taken from Inductively Coupled Plasma Atomic Emission Spectroscopy-Prominent Lines, EPA-600/4-79-017. They are given as a guide for an instrumental limit. The actual method detection limits are sample dependent and may vary as the sample matrix varies.

**MERCURY**  
**WATER EPA METHOD 245.1 AND SW846 METHOD 7470**  
**SOIL/SEDIMENT EPA METHOD 245.5 AND SW846 METHOD 7471**

Element	Water Accuracy %R	Water Precision RPD	Soil Accuracy %R	Soil Precision RPD	Completeness %	Water MRL (ug/L)	Soil MRL (mg/Kg)	Water MDL (ug/L)	Soil MDL (mg/Kg)
Mercury	71 - 109	0 - 20	75 - 112	0 - 20	95	0.2	0.2	0.07	0.01

**TABLE 20.**  
**REQUIRED CONTAINERS, PRESERVATION TECHNIQUES**  
**AND HOLDING TIMES FOR WATER SAMPLES**

CHEMICAL ANALYSES	MINIMUM VOLUME (mL)*	PLASTIC OR GLASS	PRESERVATION	HOLDING TIME
Acidity	100	P, G	cool, 4°C	14 days
Alkalinity	100	P, G	cool, 4°C	14 days
Ammonia	100	P, G	cool, 4°C	28 days
BOD 5 day	1000	P, G	sulfuric to pH<2	48 hours
Total Organic Carbon (TOC)	50	P, G	cool, 4°C	28 days
Chemical Oxygen Demand	50	P, G	sulfuric to pH<2	28 days
Chloride	100	P, G	cool, 4°C	28 days
Chromium, hexavalent	100	P, G	none	24 hours
Color	50	P, G	cool, 4°C	48 hours
Conductance	100	P, G	cool, 4°C	28 days
Cyanide	100	P, G	cool, 4°C	14 days
free	100		NaOH to pH>12	
total	500			
total & amenable	1000			
Fecal Coliform	100	P, G	cool, 4°C	6 hours
Fluoride	100	P	none	28 days
Hardness	100	P, G	none	6 months
Metals (except mercury)	500	P, G	nitric to pH<2	6 months
(200.7, 200.8, 6010 & 6020)				
Mercury (245.1, 7470)	500	P, G	nitric to pH<2	28 days
Nitrogen		P, G	cool, 4°C	28 days
total Kjeldahl	100		sulfuric to pH<2	
Nitrate	100			
Nitrite	100			
Oil and Grease (413.1)	1000	G only	cool, 4°C	28 days
			sulfuric or HCl to pH<2	
Organic Analytes				
Volatiles	40	G only	cool, 4°C HCl to pH<2	14 days
BTEX, VOC's, TPH/GRO	(3 per sample)	PTFE septa for VOA's		
(8020, 8260A, 8260B 8015mod)				
Volatiles (524.2)	40	G only	cool, 4°C, 3 mg of Na2S2O3	14 days
	(3 per sample)	PTFE septa for VOA's		
EDB, DBCP (8011)	40	G only		
	(3 per sample)	PTFE septa for VOA's	cool, 4°C, 4 drops of 10% Na2S2O3.	14 days
Semi-volatiles (505)	40	G only	cool, 4°C, 3 mg of Na2S2O3.	7 days to extr.
	(3 per sample)	PTFE septa for VOA's		
TPH/DRO	1000	G only	cool, 4°C	7 days to extr.
Semi-volatiles (8270B)	1000	with PTFE	cool, 4°C	40 days after
Semi-volatiles (525.2)	1000	lined cap	cool, 4°C, 50 mg of Na2SO3	14 days
			HCl to pH<2	
Pesticides/PCB's (8081)	1000		cool, 4°C	7 days to extr.
Herbicides (8150, 8151)	1000		cool, 4°C	40 days after
PH (150.1)	100	P, G	none	immediately
Phenolics	100	G only	cool, 4°C	28 days
			sulfuric to pH<2	
Phosphorous				
ortho phosphate	50	P, G	filter on site	48 hours
total phosphate	50	P, G	cool, 4°C	48 hours



**TABLE 20. (cont.)  
REQUIRED CONTAINERS, PRESERVATION TECHNIQUES  
AND HOLDING TIMES FOR WATER SAMPLES**

CHEMICAL ANALYSES	MINIMUM VOLUME (mL)*	PLASTIC OR GLASS	PRESERVATION	HOLDING TIME
Solids		P,G	cool, 4°C	
dissolved	100			48 hours
suspended	250			7 days
total	250			7 days
volatile	250			7 days
settleable	1000			48 hours
Sulfate	50	P,G	cool, 4°C	28 days
Sulfide	500	P,G	cool, 4°C	7 days
			2 mL ZnOAc and NaOH to pH>9	
Sulfite	50	P,G	none	immediately
Total Recoverable Petroleum	1000	G only	cool, 4°C	7 days
Hydrocarbons (418.1)		with Teflon lined cap	HCl to pH <2	
Turbidity	100	P,G	cool, 4°C	48 hours

**REQUIRED CONTAINERS, PRESERVATION TECHNIQUES  
AND HOLDING TIMES FOR SOIL SAMPLES**

CHEMICAL ANALYSES	MINIMUM CONTAINER SIZE (mL)*	PLASTIC OR GLASS	PRESERVATION	HOLDING TIME
Nutrients/TOC	400	P	cool to 4 <sup>0</sup> C	14 days
Metals (except mercury) (6010 & 6020)	250	P or G	none required	6 months
Mercury	250	P or G	cool to 4 <sup>0</sup> C	28 days
Volatile Organics (SW846 8240, 8260, 8020, 8010)	125	G only with PTFE lined cap	dark, cool to 4 <sup>0</sup> C	14 days
Volatile Organics Low Level (SW846 8260B/5035)	3 x 40 mL	G only with PTFE lined cap	5ml of 20% sodium bisulfate, dark, cool to 4 <sup>0</sup> C	14 days
Volatile Organics High Level (SW846 8260B/5035)	1 X 40 mL	G only with PTFE lined cap	10 mL of purge and trap grade methanol, dark, cool to 4 <sup>0</sup> C	14 days
Volatile Organics percent moisture (SW846 8260B/5035)	1 X 40 mL	G only with PTFE lined cap	dark, cool to 4 <sup>0</sup> C	14 days
Semi-volatile organics, TPH, pesticides, PCB's, etc. (SW846 8270, 8080)	250	G only with PTFE lined cap	dark, cool to 4 <sup>0</sup> C	14 days before extraction, 40 days after extraction
BTEX (SW846 8020)	125	G only with PTFE lined cap	dark, cool to 4 <sup>0</sup> C	14 days
TPH by GC (SW846 8015 modified)	125	G only with PTFE lined cap	dark, cool to 4 <sup>0</sup> C	14 days
TPH by IR (EPA 418.1)	125	G only with PTFE lined cap	dark, cool to 4 <sup>0</sup> C	7 days

\* - These are recommended minimum volumes for individual parameters. Some parameters with similar requirements may be combined in a larger container. Please call the laboratory for advice if you wish to combine sampling containers for multiple analyses.

TABLE 21.  
GEO Analytical Equipment List

Equipment	Manufacturer	Model	Number Owned	
Gas Chromatograph	Hewlett Packard	5890 Series II	V-2 P-2	4
Gas Chromatograph	Varian	3400 CX	P-2 V-1	2
Gas Chromatograph/ Mass Spectrometer	Varian	Saturn GC/MS/MS	V-2 S-2	24
<del>Automatic Sampler</del>	<del>Dynatech</del>	<del>PTA WS30</del>		<del>1</del>
Vial Autosampler	Varian	8100	P-1	1
Vial Autosampler	Varian	8200	S-1 <del>2</del>	1
ICP	Varian	Liberty 100		1
ICP/MS	Varian	Ultramass		1
Microwave Digestor	CEM	MDS 2100		1
Vial Autosampler	Hewlett Packard	7673	P-2	2
Autosampler	Varian	SPS-5	M-1	21
Data System-Chemstation	Hewlett Packard	3365		4
Photoionization detector	O.I. Analytical	4430	V-2	22
Flame Ionization detector	O.I. Analytical	4410	<del>V-2</del> P-2	3
Flame Ionization detector ECD	Hewlett Packard		V-2 P-3	2
Purge and Trap	Tekmar	LSC 2000		3
Purge and Trap	Tekmar	LSC 3000		1
Automatic Sampler	Dynatech	Model 5100 Archon		24
Sample Concentrator	Zymark	Turbovap 200		2
Infrared Spectrophotometer	Perkin Elmer	1605		1
Ultrasonic Disruptor	Tekmar	TM375		1
Ultrasonic Disruptor	Virtis	Virsonic 300		1
Pulse Module	Virtis			1
Top Loader Balance	Sartorius	PT120		3
Analytical Balance	Sartorius	A200S		1
Analytical Balance	Sartorius	A210S		1
Analytical Mill	Tekmar	A-10		1
Ultrasonic Bath	Branson	2200		1

**TABLE 21.**  
**GEO Analytical Equipment List (Continued)**

<b>Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Number Owned</b>
Computer	PC Systems	Pentium 233	1
Computer	PC Systems	Pentium 200	6
Computer	PC Systems	Pentium 150	1
Computer	PC Systems	Pentium 133	4
Computer	PC Systems	Pentium 200	1
Computer	PC Systems	Pentium 466	1
Computer	PC Systems	Pentium 366	2
Computer	PC Systems	Pentium 333	2
Computer	Digital Equipment Corp	Pentium 166	1
Computer	Compaq	Pentium 400	1
Laser Printer	Panasonic	KX-P4420	2
Laser Printer	Panasonic	KX-P4430	1
Laser Printer	Panasonic	KX-P4440	2
Laser Printer	Panasonic	KX-P4400	1
Laser Printer	Minolta	PageWorks 20	1
Laboratory Fume Hood	Labconco	Protector 72	3
Wrist Shaker	Lab Line	MultiWrist	1
Drying Oven	Scientific Products		3
pH Meter	Orion	Model 420A	1
Ultrasonic Nebulizer	<del>Varian</del> CETAC	Model U-5000 AT	1
Hot Plate	Lindberg	Blue M 53025	1
Vapor Generation Accessory	Varian	Model 76	1
Mercury Analyzer System	Cetac	M6000-A	1
Zero Headspace Extractor	Millipore		5
Haz Waste Filtration System	Millipore		1
Environmental Rotator	Environ. Express	LE6000	1
Water Bath	VWR Scientific	1245	1

Table A-1  
QUALITY CONTROL FOR METALS METHODS

Frequency of method blanks	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch	one per every 20 samples or analytical batch
Initial Calibration Blank Verification (ICB)	following instrument calibration and must be less than the minimum reporting limit or less than 10% of the sample concentration	following instrument calibration and must be less than the minimum reporting limit or less than 10% of the sample concentration	following instrument calibration and must be less than the minimum reporting limit or less than 10% of the sample concentration
Initial Calibration Verification (ICV)	following instrument calibration verify calibration with an independently prepared check standard. %R = 95 – 105%	following instrument calibration verify calibration with an independently prepared check standard. %R = 95 – 105%	following instrument calibration verify calibration with an independently prepared check standard. %R = 95 – 105%
Laboratory Control Samples	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.
Frequency of MS and MSD's	one MS/MSD per 20 samples or analytical batch.	one MS/MSD per 20 samples or analytical batch.	one MS/MSD per 20 samples or analytical batch.
Accuracy and Precision	compound dependent see Table A-4.	compound dependent see Table A-4.	compound dependent see Table A-4.
Internal Standards	yes	yes	yes
Initial Calibration	3 levels and a blank $r^2 \geq 0.995$	3 levels and a blank $r^2 \geq 0.995$	3 levels and a blank $r^2 \geq 0.995$
Continuing Calibration Blank Verification (CCB)	after every ten samples and at the end of each sequence and must be less than the minimum reporting limit or less than 10% of the sample concentration	after every ten samples and at the end of each sequence and must be less than the minimum reporting limit or less than 10% of the sample concentration	after every ten samples and at the end of each sequence and must be less than the minimum reporting limit or less than 10% of the sample concentration
Continuing Calibration Verification (CCV)	after every ten samples and at the end of each sequence and must be within 90-100% of initial calibration	after every ten samples and at the end of each sequence and must be within 90-100% of initial calibration	after every ten samples and at the end of each sequence and must be within 90-100% of initial calibration
Interference Check Samples (ICS)	n/a	Run at the beginning of each sequence. ICSA target analytes must be below reporting limit or less than 10% of the sample concentration. ICSAB target analytes must be $\pm 20\%$ of expected.	n/a.
Mass Calibration and Performance Parameters	Table A-5.	Table A-5.	Table A-5.
Detection Limits	Table A-4	Table A-4	Table A-4

TABLE A-2.  
QUALITY CONTROL FOR ORGANIC CONTAMINANTS

	GAM 505	GAM 525.2	GAM 8011	GPBM 8015	GPBM 8260	GAM 8260B
Frequency of method blanks	one per every 20 samples or 24 hours. Whichever is more frequent.	one per every 20 samples or 12 hours. Whichever is more frequent.	one per analytical batch or every 20 samples.	one per analytical batch or every 20 samples.	one per analytical batch or every 20 samples.	one per analytical batch or every 20 samples.
Frequency of Reagent blanks	One per 20 samples or 24 hours. Whichever is more frequent.	One per 20 samples or 12 hours. Whichever is more frequent.	One per ten analytical samples.	One per ten analytical samples.	One per 12 hour clock	One per 12 hour clock
Surrogates	no	% R = 70 - 130	no	no	1,2-dichloroethane-d4 placed in all samples, blanks, spikes, duplicates. Acceptable recovery range. Table A-3	placed in all samples, blanks, spikes, duplicates. %R ranges in Table A-3.
Laboratory Control Samples	one LFB per 20 samples or 24 hours.	one LFB per 20 samples or 12 hours.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.
Frequency of MS and MSD	one LFM & LFMD per 20 samples or 24 hours. Same conc as LFB.	one LFM & LFMD per 20 samples or 24 hours. Same conc as LFB	one MS/MSD per analytical batch or every 20 samples.	one MS/MSD per every analytical batch or 20 samples.	one MS/MSD per every analytical batch or 20 samples.	one MS/MSD per every analytical batch or 20 samples.
Accuracy Precision	% R = 70 - 130 RPD < 30%	% R = 70 - 130 RPD < 30%	%R=50 -150 RPD < 50%	%R=50 - 150 RPD < 30%	compound dependent see Table 18.	compound dependent see Table 7A.
Internal standards	no	ISTD's in the CCV should be >70% CCV to CCV, but must be >50% of initial calib.	no	no	ISTD's must be < +100% and >50% of the last CCV.	ISTD's must be < +100% and >50% of the last CCV.
Initial calibration	3 point minimum	5 point minimum, 6 point recommended.	5 point minimum ≤ 20% RSD for average RF. $r^2 \geq 0.990$	5 point minimum ≤ 20% RSD for average RF. $r^2 \geq 0.990$	5 point minimum ≤ 30% RSD for average RF. $r^2 \geq 0.990$	5 point minimum ≤ 30% RSD for average RF of CCC's, < 15% RSD for all others or $r^2 \geq 0.990$
Continuing Calibration Check	calibration standard run every 10 samples and must be within ± 20 % diff. of average RF	calibration standard run every 12 hours and must be within ± 30 % diff. of average RF or ±30% of value	calibration standard run every 10 samples and must be within ± 40 % diff. of average RF	calibration standard run every 10 samples and must be within ± 15 % diff. Of average RF	calibration standard run every 10 samples and must be within ± 15 % diff. of average RF	calibration standard run every 12 hours and must be within ± 20 % diff. of average RF
Ending Calibration Check	no	no	run at the end of each sequence and must be within ± 40% diff of average RF	run at the end of each sequence and must be within ± 15 % diff. of average RF	run at the end of each sequence and must be within ± 15 % diff. of average RF	n/a
Other	Daily PEM mix < 20% Endrin breakdown. QCS sample run at least quarterly.	Daily PEM mix < 20% Endrin breakdown. QCS sample run at least quarterly.	none	none	none	none
Tuning parameters	no	DFTPP criteria in table A-5, every 12 hours while samples are being run.	no	no	no	BFB to criteria in Table A-5, every 12 hours while samples are being run.
Detection limits	Table A-3	Table A-3	Table A-3	Table A-3.	Table A-3.	Table A-3.

**Table A-2**  
**QUALITY CONTROL FOR ORGANIC CONTAMINANTS**

	<b>GAM 505</b>	<b>GAM 525.2</b>	<b>GAM 8011</b>	<b>GPBM 8015</b>	<b>GPBM 8260</b>	<b>GAM 8260B</b>
<b>Frequency of method blanks</b>	one per every 20 samples or 24 hours. Whichever is more frequent.	one per every 20 samples or 12 hours. Whichever is more frequent.	one per analytical batch or every 20 samples.	one per analytical batch or every 20 samples.	one per analytical batch or every 20 samples.	one per analytical batch or every 20 samples.
<b>Frequency of Reagent blanks</b>	One per 20 samples or 24 hours. Whichever is more frequent.	One per 20 samples or 12 hours. Whichever is more frequent.	One per ten analytical samples.	One per ten analytical samples.	One per 12 hour clock	One per 12 hour clock
<b>Surrogates</b>	no	% R = 70 - 130	no	no	1,2-dichloroethane-d4 placed in all samples, blanks, spikes, duplicates. Acceptable recovery range. Table A-3	placed in all samples, blanks, spikes, duplicates. %R ranges in Table A-3.
<b>Laboratory Control Samples</b>	one LFB per 20 samples or 24 hours.	one LFB per 20 samples or 12 hours.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.	one LCS per 20 samples or analytical batch.
<b>Frequency of MS and MSD</b>	one LFM & LFMD per 20 samples or 24 hours. Same conc as LFB.	one LFM & LFMD per 20 samples or 24 hours. Same conc as LFB	one MS/MSD per analytical batch or every 20 samples.	one MS/MSD per every analytical batch or 20 samples.	one MS/MSD per every analytical batch or 20 samples.	one MS/MSD per every analytical batch or 20 samples.
<b>Accuracy Precision</b>	% R = 70 - 130 RPD < 30%	% R = 70 - 130 RPD < 30%	%R=50 -150 RPD < 50%	%R=50 - 150 RPD < 30%	compound dependent see Table 18.	compound dependent see Table 7A.
<b>Internal standards</b>	no	ISTD's in the CCV should be >70% CCV to CCV, but must be >50% of initial calib.	no	no	ISTD's must be < +100% and >50% of the last CCV.	ISTD's must be < +100% and >50% of the last CCV.
<b>Initial calibration</b>	3 point minimum	5 point minimum, 6 point recommended.	5 point minimum ≤ 20% RSD for average RF. $r^2 \geq 0.990$	5 point minimum ≤ 20% RSD for average RF. $r^2 \geq 0.990$	5 point minimum ≤ 30% RSD for average RF. $r^2 \geq 0.990$	5 point minimum ≤ 30% RSD for average RF of CCC's, < 15% RSD for all others or $r^2 \geq 0.990$
<b>Continuing Calibration Check</b>	calibration - standard run every 10 samples and must be within ± 20 % diff. of average RF	calibration standard run every 12 hours and must be within ± 30 % diff. of average RF or ±30% of value	calibration standard run every 10 samples and must be within ± 40 % diff. of average RF	calibration standard run every 10 samples and must be within ± 15 % diff. Of average RF	calibration standard run every 10 samples and must be within ± 15 % diff. of average RF	calibration standard run every 12 hours and must be within ± 20 % diff. of average RF
<b>Ending Calibration Check</b>	no	no	run at the end of each sequence and must be within ± 40% diff of average RF	run at the end of each sequence and must be within ± 15 % diff. of average RF	run at the end of each sequence and must be within ± 15 % diff. of average RF	n/a
<b>Other</b>	Daily PEM mix < 20% Endrin breakdown. QCS sample run at least quarterly.	Daily PEM mix < 20% Endrin breakdown. QCS sample run at least quarterly.	none	none	none	none
<b>Tuning parameters</b>	no	DFTPP criteria in table A-5, every 12 hours while samples are being run.	no	no	no	BFB to criteria in Table A-5, every 12 hours while samples are being run.
<b>Detection limits</b>	Table A-3	Table A-3	Table A-3	Table A-3.	Table A-3.	Table A-3.

**Table A-3**  
**GAM 525.2**  
**METHOD DETECTION LIMITS (MDLS) FOR ANALYTES FROM REAGENT WATER**

#	Compound	Mean	SR	Acceptance Limits	4RSD	Precision Limits	MDL (UG/L)	MRL (UG/L)
1	Naphthalene	4.589	92%	70 - 130	3%	0 - 30	0.09	0.5
2	Hexachlorocyclopentadiene	4.120	82%	70 - 130	11%	0 - 30	0.09	0.5
3	2,6-Dinitrotoluene	4.986	100%	70 - 130	2%	0 - 30	0.12	0.5
4	Acenaphthylene	3.986	80%	70 - 130	2%	0 - 30	0.11	0.5
5	Acenaphthene	4.038	81%	70 - 130	2%	0 - 30	0.11	0.5
6	2,4-Dinitrotoluene	5.146	103%	70 - 130	2%	0 - 30	0.12	0.5
7	Propachlor	4.702	94%	70 - 130	3%	0 - 30	0.09	0.5
8	Fluorene	4.290	86%	70 - 130	5%	0 - 30	0.11	0.5
9	Hexachlorobenzene	4.748	95%	70 - 130	4%	0 - 30	0.07	0.5
10	Simazine	5.194	104%	70 - 130	7%	0 - 30	0.13	0.5
11	Atrazine	4.894	98%	70 - 130	2%	0 - 30	0.12	0.5
12	Pentachlorophenol	5.784	116%	70 - 130	3%	0 - 30	0.10	0.5
13	gamma-BHC	5.010	100%	70 - 130	6%	0 - 30	0.12	0.5
14	Phenanthrene	4.854	97%	70 - 130	4%	0 - 30	0.06	0.5
15	Anthracene	4.485	90%	70 - 130	2%	0 - 30	0.11	0.5
16	Alachlor	5.090	102%	70 - 130	4%	0 - 30	0.10	0.5
17	Metribuzin	4.560	91%	70 - 130	6%	0 - 30	0.12	0.5
18	Heptachlor	5.013	100%	70 - 130	3%	0 - 30	0.08	0.5
19	Cyanazine	5.440	109%	70 - 130	5%	0 - 30	0.13	0.5
20	Metolachlor	4.982	100%	70 - 130	4%	0 - 30	0.15	0.5
21	Aldrin	4.830	97%	70 - 130	6%	0 - 30	0.08	0.5
22	Heptachlor epoxide	5.171	103%	70 - 130	3%	0 - 30	0.08	0.5
23	Fluoranthene	5.009	100%	70 - 130	4%	0 - 30	0.09	0.5
24	Butachlor	4.888	98%	70 - 130	6%	0 - 30	0.13	0.5
25	alpha-Chlordane	4.810	96%	70 - 130	5%	0 - 30	0.09	0.5
26	gamma-Chlordane	4.982	100%	70 - 130	5%	0 - 30	0.06	0.5
27	trans-Nonachlor	5.208	104%	70 - 130	2%	0 - 30	0.16	0.5
28	Pyrene	4.701	94%	70 - 130	3%	0 - 30	0.08	0.5
29	Dieldrin	4.059	81%	70 - 130	4%	0 - 30	0.14	0.5
30	Endrin	4.832	97%	70 - 130	6%	0 - 30	0.27	0.5
31	bis(2-Ethylhexyl)adipate	4.564	91%	70 - 130	10%	0 - 30	0.15	0.5
32	Methoxychlor	3.713	74%	70 - 130	0%	0 - 30	0.03	0.5
33	bis(2-Ethylhexyl)phthalate	4.830	97%	70 - 130	7%	0 - 30	0.68	1.0
34	Benzo(a)anthracene	4.521	90%	70 - 130	1%	0 - 30	0.04	0.5
35	Chrysene	4.266	85%	70 - 130	2%	0 - 30	0.03	0.5
36	Benzo(b)fluoranthene	4.674	93%	70 - 130	2%	0 - 30	0.10	0.5
37	Benzo(k)fluoranthene	4.235	85%	70 - 130	4%	0 - 30	0.07	0.5
38	Benzo(a)pyrene	8.474	85%	70 - 130	1%	0 - 30	0.16	0.2
39	Indeno(1,2,3-c,d)pyrene	4.621	92%	70 - 130	3%	0 - 30	0.13	0.5
40	Dibenzo(a,h)anthracene	4.547	91%	70 - 130	2%	0 - 30	0.17	0.5
41	Benzo(ghi)perylene	4.293	86%	70 - 130	8%	0 - 30	0.17	0.5

Table A-3 (cont.)  
GAM 505  
METHOD DETECTION LIMITS (MDLS) FOR ANALYTES FROM REAGENT WATER

COMPOUND	Accuracy Limits	RPD Limits	STD.	MDL	MRL
Hexachlorocyclopentadiene	70 - 130	0 - 30	0.0060	0.0190	0.2
Hexachlorobenzene	70 - 130	0 - 30	0.0017	0.0052	0.2
Simazine	70 - 130	0 - 30	2.5069	7.8718	50
Atrazine	70 - 130	0 - 30	1.0800	3.3912	50
gamma-BHC (Lindane)	70 - 130	0 - 30	0.0033	0.0103	0.2
Heptachlor	70 - 130	0 - 30	0.0065	0.0204	0.2
Alachlor	70 - 130	0 - 30	0.0442	0.1389	2
Aldrin	70 - 130	0 - 30	0.0071	0.0224	0.2
Heptachlor epoxide	70 - 130	0 - 30	0.0110	0.0345	0.2
gamma-Chlordane	70 - 130	0 - 30	0.0024	0.0076	0.2
alpha-Chlordane	70 - 130	0 - 30	0.0024	0.0074	0.2
cis-Nanochlor	70 - 130	0 - 30	0.0028	0.0088	0.2
Dieldrin	70 - 130	0 - 30	0.0031	0.0097	0.2
Endrin	70 - 130	0 - 30	0.0044	0.0139	0.2
trans-Nanochlor	70 - 130	0 - 30	0.0046	0.0144	0.2
Methoxychlor	70 - 130	0 - 30	0.0439	0.1378	1

GAM 8011  
QC Acceptance Criteria and Detection Limit Summary

Analyte	Accuracy %R	Precision RPD	Completeness %	MDL (ug/L)	MRL (ug/L)
EDB	50 - 150	0 - 50	95	0.039	0.05
DBCP	50 - 150	0 - 50	95	0.047	0.20

GAM 8260A  
QC Acceptance Criteria and Detection Limit Summary

COMPOUNDS	Accuracy %R	Precision RPD	Completeness %	Water MRL (ug/L)	Soil MRL (ug/Kg)	Water MDL (ug/L)	Soil MDL (ug/Kg)
Propyl acetate	40 - 160	0 - 30	95	10	10	0.16	0.25
n-Hexane	40 - 160	0 - 30	95	5.0	5.0	0.46	0.43

GPBM 8015  
Precision and Accuracy Limits for LCS, MS and MSD

COMPOUNDS	Completeness %	Water MDL (mg/L)	Water MRL (mg/L)	Accuracy %R	Precision RPD	Soil MRL (mg/Kg)	Soil MDL (mg/Kg)
Propylene glycol	95	1.22	10.0	50 - 150	40	4.0	4.0



Table A-3 (Cont.)

**GAM 8260B**  
**Acceptance Limits for Laboratory Control Samples, Matrix Spikes,**  
**and Spike Duplicates on Volatile Organics by GC/MS**

COMPOUNDS	Water Accuracy %R	Water Precision RPD	Soil Accuracy %R	Soil Precision RPD	HL Soil Accuracy %R	HL Soil Precision RPD
1,1-Dichloroethene	67 - 149	14	36 - 156	19	59-172	22
Trichloroethene	67 - 131	12	50 - 119	21	66-142	21
Benzene	61 - 124	11	55 - 115	21	62-137	24
Toluene	54 - 138	12	54 - 117	19	59-139	21
Chlorobenzene	71 - 128	13	51 - 124	21	60-133	21

**GAM 8260B SURROGATE RECOVERIES**

METHOD 8240/8260A Surrogates	Acceptable Range for Water	Acceptable Range for Soil	Acceptable Range for High Level Soil
1,2-Dichloroethane d4	84 - 123	91 - 126	59 - 141
Toluene d8	91 - 117	66 - 136	56 - 152
Bromofluorobenzene	85 - 111	67 - 123	48 - 152

**GPBM 8260A SURROGATE RECOVERIES**

METHOD 8240/8260A Surrogates	Acceptable Range for Water	Acceptable Range for Soil	Acceptable Range for High Level Soil
1,2-Dichloroethane d4	84 - 123	91 - 126	59 - 141

**TABLE A-4**  
**METALS BY INDUCTIVELY COUPLED PLASMA MASS SPECTROMETRY (ICP-MS)**  
**WATER EPA METHOD 200.8 AND SW846 METHOD 6020**  
**SOIL/SEDIMENT SW846 METHOD 6020**

Element	Water Accuracy ±R	Precision RPD %	Soil Accuracy ±R	Precision RPD %	Completeness %	Water MRL (ug/L)	Soil MRL (mg/Kg)	Water MDL (ug/L)	Soil MDL (mg/Kg)
Aluminum	75 - 125	0 - 20	75 - 125	0 - 20	95	100	20.0	1.583	0.1583
Antimony	75 - 125	0 - 20	75 - 125	0 - 20	95	6	1.5	0.093	0.0093
Arsenic	75 - 125	0 - 20	75 - 125	0 - 20	95	25	3.0	0.517	0.0517
Barium	75 - 125	0 - 20	75 - 125	0 - 20	95	15	3.0	0.471	0.0471
Beryllium	75 - 125	0 - 20	75 - 125	0 - 20	95	4	0.5	0.101	0.0101
Cadmium	75 - 125	0 - 20	75 - 125	0 - 20	95	5	1.0	0.120	0.0120
Calcium	75 - 125	0 - 20	75 - 125	0 - 20	95				
Chromium	75 - 125	0 - 20	75 - 125	0 - 20	95	5	1.0	0.230	0.0230
Cobalt	75 - 125	0 - 20	75 - 125	0 - 20	95	5	1.0	0.083	0.0083
Copper	75 - 125	0 - 20	75 - 125	0 - 20	95	5	1.0	0.497	0.0497
Iron	75 - 125	0 - 20	75 - 125	0 - 20	95				
Lead	75 - 125	0 - 20	75 - 125	0 - 20	95	4	0.5	0.158	0.0158
Lithium	75 - 125	0 - 20	75 - 125	0 - 20	95				
Magnesium	75 - 125	0 - 20	75 - 125	0 - 20	95				
Manganese	75 - 125	0 - 20	75 - 125	0 - 20	95	5	1.0	0.164	0.0164
Molybdenum	75 - 125	0 - 20	75 - 125	0 - 20	95				
Nickel	75 - 125	0 - 20	75 - 125	0 - 20	95	15	3.0	0.557	0.0557
Potassium	75 - 125	0 - 20	75 - 125	0 - 20	95				
Selenium	75 - 125	0 - 20	75 - 125	0 - 20	95	25	3.0	0.630	0.0630
Silver	75 - 125	0 - 20	75 - 125	0 - 20	95	5	0.5	0.074	0.0074
Sodium	75 - 125	0 - 20	75 - 125	0 - 20	95				
Thallium	75 - 125	0 - 20	75 - 125	0 - 20	95	2	0.5	0.061	0.0061
Vanadium	75 - 125	0 - 20	75 - 125	0 - 20	95	5	1.0	0.130	0.0130
Zinc	75 - 125	0 - 20	75 - 125	0 - 20	95	15	3.0	2.649	0.2649

note - The estimated detection limits as shown are taken from Inductively Coupled Plasma Atomic Emission Spectroscopy-Prominent Lines, EPA-600/4-79-017. They are given as a guide for an instrumental limit. The actual method detection limits are sample dependent and may vary as the sample matrix varies.

# TABLE A-5 MASS SPECTROMETER TUNING ICP-MS METHODS

## MASS CALIBRATION AND SYSTEM PERFORMANCE TEST CRITERIA

### Mass Calibration\*

	EPA 200.8	SW846 6020
Mass shift limit	< or = 1 amu	< or = 1 amu

### Performance Test\*

	EPA 200.8	SW846 6020
Replicates Required	minimum of 5	minimum of 4
Instrument Stability Requirement	RSD < or = 5%	RSD < 5%
Resolution Requirements	approximately 0.75 amu at 5% peak height recommended	< 0.9 amu full width at 10% peak height required
Ratio CeO/Ce	< 3% recommended	< 3% recommended
Ratio Ba <sup>++</sup> /Ba	< 5% recommended	< 5% recommended
Monitor Background at Mass	228 or 220	228 or 220

- Mass Calibration and Performance Test use tuning solution with analytes covering the entire mass range at a concentration of 100 ug/L.

## GC/MS METHODS

### ION ABUNDANCE TUNING CRITERIA FOR 4-BROMOFLUOROBENZENE (BFB)

#### Criteria for GAM 8260B and GPBM 8260

m/e	RELATIVE ABUNDANCE CRITERIA
50	15.0 - 40.0 % of mass 95.
75	30.0 - 60.0 % of mass 95.
95	Base peak, 100 % relative abundance.
96	5.0 - 9.0 % of mass 95.
173	Less than 2.0 % of mass 174.
174	Greater than 50.0 % of mass 95.
175	5.0 - 9.0 % of mass 174.
176	> 95.0 % but < 101.0 % of mass 174.
177	5.0 - 9.0 % of mass 176.

### ION ABUNDANCE TUNING CRITERIA FOR DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

#### Criteria used for GAM 525.2

m/e	RELATIVE ABUNDANCE CRITERIA
51	10 - 80 % of mass 198.
68	Less than 2 % of mass 69.
70	Less than 2 % of mass 69.
127	10 - 80 % of mass 198.
197	Less than 1 % of mass 198.
198	Base peak or >50 % of mass 442
199	5 - 9 % of mass 198.
275	10 - 60 % of mass 198.
365	Greater than 1 % of base peak.
441	Present but less than mass 443.
442	Base peak or > 50 % of mass 198.
443	15 - 24 % of mass 442.

**Table A - 6**  
**Equations Used for Metals Analysis by ICP-MS**  
**External Standard Quantitation**

Parameter	Equation	Units
Water concentration	$(C_x) (d)$ <p>where :</p> <p><math>C_x</math> = concentration of the element being measured from the calibration curve in ug/L</p> <p><math>d</math> = dilution factor</p>	µg/L
Soil concentration (dry weight)	$\frac{(C_x) (V_l) (d)}{(W_s)}$ <p>where :</p> <p><math>C_x</math> = concentration of the element being measured from the calibration curve in ug/L</p> <p><math>W_s</math> = initial dry weight of sample in Kg</p> <p><math>d</math> = dilution factor</p> <p><math>V_l</math> = final volume of digestate in liters</p>	mg/Kg

TABLE A-7.  
REQUIRED CONTAINERS, PRESERVATION TECHNIQUES  
AND HOLDING TIMES FOR WATER SAMPLES

CHEMICAL ANALYSES	MINIMUM VOLUME (mL)*	PLASTIC OR GLASS	PRESERVATION	HOLDING TIME
Acidity	100	P, G	cool, 4°C	14 days
Alkalinity	100	P, G	cool, 4°C	14 days
Ammonia	100	P, G	cool, 4°C	28 days
BOD 5 day	1000	P, G	sulfuric to pH<2 cool, 4°C	48 hours
Total Organic Carbon (TOC)	50	P, G	cool, 4°C	28 days
Chemical Oxygen Demand	50	P, G	sulfuric to pH<2 cool, 4°C	28 days
Chloride	100	P, G	sulfuric to pH<2 none	28 days
Chromium, hexavalent	100	P, G	cool, 4°C	24 hours
Color	50	P, G	cool, 4°C	48 hours
Conductance	100	P, G	cool, 4°C	28 days
Cyanide	100	P, G	cool, 4°C	14 days
free	100		NaOH to pH>12	
total	500			
total & amenable	1000			
Fecal Coliform	100	P, G	cool, 4°C	6 hours
Fluoride	100	P	none	28 days
Hardness	100	P, G	none	6 months
Metals (except mercury) (200.7, 200.8, 6010 & 6020)	500	P, G	nitric to pH<2	6 months
Mercury (245.1, 7470)	500	P, G	nitric to pH<2	28 days
Nitrogen	100	P, G	cool, 4°C	28 days
total Kjeldahl	100		sulfuric to pH<2	
Nitrate	100			
Nitrite	100			
Oil and Grease (413.1)	1000	G only	cool, 4°C sulfuric to pH<2	28 days
Organic Analytes				
Volatiles	40	G only	cool, 4°C HCl to pH<2	14 days
BTEX, VOC's, TPH/GRO (8020, 8260A, 8260B 8015mod)	(3 per sample)	PTFE septa for VOA's		
EDB, DBCP (8011)	40	G only	cool, 4°C, 4 drops of 10% Na2S2O3.	14 days
	(3 per sample)	PTFE septa for VOA's		
Semi-volatiles (505)	40	G only	cool, 4°C, 3 mg of Na2S2O3.	7 days to extr.
	(3 per sample)	PTFE septa for VOA's		
TPH/DRO	1000	G only	cool, 4°C	7 days to extr.
Semi-volatiles (8270B)	1000	with PTFE lined cap	cool, 4°C	40 days after extr.
Semi-volatiles (525.2)	1000		cool, 4°C, 50 mg of Na2SO3	
Pesticides/PCB's (8081)	1000		cool, 4°C	
Herbicides (8150, 8151)	1000		cool, 4°C	
PH (150.1)	100	P, G	none	immediately
Phenolics	100	G only	cool, 4°C sulfuric to pH<2	28 days
Phosphorous				
ortho phosphate	50	P, G	filter on site	48 hours
total phosphate	50	P, G	cool, 4°C	48 hours

**TABLE A-7. (cont.)  
REQUIRED CONTAINERS, PRESERVATION TECHNIQUES  
AND HOLDING TIMES FOR WATER SAMPLES**

CHEMICAL ANALYSES	MINIMUM VOLUME (mL)*	PLASTIC OR GLASS	PRESERVATION	HOLDING TIME
Solids		P,G	cool, 4°C	
dissolved	100			48 hours
suspended	250			7 days
total	250			7 days
volatile	250			7 days
settleable	1000			48 hours
Sulfate	50	P,G	cool, 4°C	28 days
Sulfide	500	P,G	cool, 4°C	7 days
			2 mL ZnOAc and NaOH to pH>9	
Sulfite	50	P,G	none	immediately
Total Recoverable Petroleum	1000	G only	cool, 4°C	7 days
Hydrocarbons (418.1)		with Teflon lined cap	HCl to pH <2	
Turbidity	100	P,G	cool, 4°C	48 hours

**REQUIRED CONTAINERS, PRESERVATION TECHNIQUES  
AND HOLDING TIMES FOR SOIL SAMPLES**

CHEMICAL ANALYSES	MINIMUM CONTAINER SIZE (mL)*	PLASTIC OR GLASS	PRESERVATION	HOLDING TIME
Nutrients/TOC	400	P	cool to 4°C	14 days
Metals (except mercury) (6010 & 6020)	250	P or G	none required	6 months
Mercury	250	P or G	cool to 4°C	28 days
Volatile Organics (SW846 8240, 8260, 8020, 8010)	125	G only with PTFE lined cap	dark, cool to 4°C	14 days
Volatile Organics Low Level (SW846 8260B/5035)	3 x 40 mL	G only with PTFE lined cap	5ml of 20% sodium bisulfate, dark, cool to 4°C	14 days
Volatile Organics High Level (SW846 8260B/5035)	1 X 40 mL	G only with PTFE lined cap	10 mL of purge and trap grade methanol, dark, cool to 4°C	14 days
Volatile Organics percent moisture (SW846 8260B/5035)	1 X 40 mL	G only with PTFE lined cap	dark, cool to 4°C	14 days
Semi-volatile organics, TPH, pesticides, PCB's, etc. (SW846 8270, 8080)	250	G only with PTFE lined cap	dark, cool to 4°C	14 days before extraction, 40 days after extraction
BTEX (SW846 8020)	125	G only with PTFE lined cap	dark, cool to 4°C	14 days
TPH by GC (SW846 8015 modified)	125	G only with PTFE lined cap	dark, cool to 4°C	14 days
TPH by IR (EPA 418.1)	125	G only with PTFE lined cap	dark, cool to 4°C	7 days

\* - These are recommended minimum volumes for individual parameters. Some parameters with similar requirements may be combined in a larger container. Please call the laboratory for advice if you wish to combine sampling containers for multiple analyses



**ATTACHMENT C**

**CHAIN OF CUSTODY FORM, CUSTODY SEAL AND SAMPLE LABELS**



**QEC**  
Quality Environmental Containers  
800-255-3950 • 304-255-3900

**CUSTODY SEAL**  
DATE \_\_\_\_\_  
SIGNATURE \_\_\_\_\_

P.O. Box 1160  
Baltimore, MD 21203  
800-255-3950 • 304-255-3900

Quality Environmental Containers

PROJECT NAME \_\_\_\_\_

SAMPLE ID	SAMPLE DATE	SAMPLE TIME
SAMPLED BY	PRESERVATIVE	
ANALYSIS REQUESTED		<input type="checkbox"/> GRAB <input type="checkbox"/> COMPOSITE

P.O. Box 1160  
Baltimore, MD 21203  
800-255-3950 • 304-255-3900

Quality Environmental Containers

PROJECT NAME \_\_\_\_\_

SAMPLE ID	SAMPLE DATE	SAMPLE TIME
SAMPLED BY	PRESERVATIVE	
ANALYSIS REQUESTED		<input type="checkbox"/> GRAB <input type="checkbox"/> COMPOSITE

P.O. Box 1160  
Baltimore, MD 21203  
800-255-3950 • 304-255-3900

Quality Environmental Containers

PROJECT NAME \_\_\_\_\_

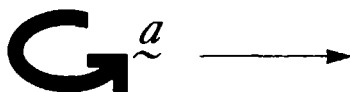
SAMPLE ID	SAMPLE DATE	SAMPLE TIME
SAMPLED BY	PRESERVATIVE	
ANALYSIS REQUESTED		<input type="checkbox"/> GRAB <input type="checkbox"/> COMPOSITE

P.O. Box 1160  
Baltimore, MD 21203  
800-255-3950 • 304-255-3900

Quality Environmental Containers

PROJECT NAME \_\_\_\_\_

SAMPLE ID	SAMPLE DATE	SAMPLE TIME
SAMPLED BY	PRESERVATIVE	
ANALYSIS REQUESTED		<input type="checkbox"/> GRAB <input type="checkbox"/> COMPOSITE

[illegible]

1. Relinquished By: \_\_\_\_\_  
Received By: \_\_\_\_\_

3. Relinquished By: \_\_\_\_\_  
Received By: \_\_\_\_\_

2. Relinquished By: \_\_\_\_\_  
Received By: \_\_\_\_\_

4. Submitted to Laboratory By: \_\_\_\_\_  
Received for Laboratory By: \_\_\_\_\_

# CHAIN OF CUSTODY



**ENTACT**

1360 N. Wood Dale Rd. Suite A  
Wood Dale, Illinois 60191  
Ph. 630/616-2100 Fax 630/616-9203

Sampler: \_\_\_\_\_ Job #: \_\_\_\_\_

ENTACT Contact: \_\_\_\_\_ Date: \_\_\_\_\_

Turnaround Time Requested				
24 Hour <input type="checkbox"/>	48 Hour <input type="checkbox"/>	3 Day <input type="checkbox"/>	Normal <input type="checkbox"/>	Other <input type="checkbox"/> _____

Sample No.	Matrix	Composite or Grab	Description/Remarks	Preservative	Analysis

Samples Relinquished By: \_\_\_\_\_ Date \_\_\_\_\_

Samples Received By: \_\_\_\_\_ Date \_\_\_\_\_

Samples Relinquished By: \_\_\_\_\_ Date \_\_\_\_\_

Samples Received By: \_\_\_\_\_ Date \_\_\_\_\_

Samples Relinquished By: \_\_\_\_\_ Date \_\_\_\_\_

Condition of Sample Upon Receipt:

Bottles Intact? Yes / No	Volatiles Free of Headspace? Yes / No	COC Seals Present and Intact? Yes / No
--------------------------	---------------------------------------	--

## ANALYSIS

A= \_\_\_\_\_ F= \_\_\_\_\_

B= \_\_\_\_\_ G= \_\_\_\_\_

C= \_\_\_\_\_ H= \_\_\_\_\_

D= \_\_\_\_\_ I= \_\_\_\_\_

E= \_\_\_\_\_ J= \_\_\_\_\_

### Distribution:

Original - To Customer w/ Final Report  
2nd Copy - To Job File  
3rd Copy - To Lab



# AIR MONITORING LOG

1360 N. Wood Dale Rd. Suite A  
 Wood Dale, Illinois 60191  
 Ph. 630/616-2100 Fax 630/616-9203

Sampler: \_\_\_\_\_ Job #: \_\_\_\_\_

ENTACT Contact: \_\_\_\_\_ Date: \_\_\_\_\_

Sample No.	Instrument I.D.	Time	Flow Rate	Volume	Type of Sample	Analysis

## NOTES AND CALCULATIONS


### Distribution:

Original - To Customer w/ Final Report  
 2nd Copy - To Job File  
 3rd Copy - To Lab

## **APPENDIX D**

### **LABORATORY ACCREDITATIONS AND CERTIFICATIONS**



OHIO E.P.A.

DEC 21 2000

Ohio Environmental Protection Agency  
Division of Emergency and Remedial Response  
Voluntary Action Program

ENTERED DIRECTOR'S JOURNAL

Under the authority of Ohio Revised Code Section 3746.04(B)(6) and Ohio Administrative Code Rule 3745-300-04

Certifies

GEOANALYTICAL, INC.

9263 RAVENNA ROAD, SUITE A-7  
TWINSBURG, OH 44087

as a

Certified Laboratory

(Number CL0008)

for the following analytes, parameter groups and methods

Aluminum/200.8,6010A,6020	Cobalt/200.8,6010A,6020	Potassium/6010A	Volatile Organic Compounds/8020A,8260A,8260B,
Antimony/200.8,6010A,6020	Copper/200.8,6010A,6020	Selenium/200.8,6010A	Semi-Volatile Organic Compounds/8270B
Arsenic/200.8,6010A,6020	Iron/6010A	Silver/200.8,6010A,6020	Organochlorine Pesticides/8081
Barium/200.8,6010A,6020	Lead/200.8,6010A,6020	Sodium/6010A	Polychlorinated Biphenyls/8081
Beryllium/200.8,6010A,6020	Lithium/6010A	Thallium/200.8,6010A,6020	Polynuclear Aromatic Hydrocarbons/8100
Cadmium/200.8,6010A,6020	Manganese/200.8,6010A,6020	Vanadium/200.8,6010A	1,2-Dibromoethane and 1,2-Dibromo/3-Chloropropane/8011*
Calcium/6010A	Mercury/7470A,7471A	Zinc/200.8,6010A,6020	Total Petroleum Hydrocarbons, Diesel Range Organics/418.1, 8015A-Modified
Chromium/200.8,6010A,6020	Nickel/200.8,6010A,6020	n-Hexane/8260A-Modified**	Total Petroleum Hydrocarbons, Gasoline Range Organics/8015A-Modified

\*Water

\*\*In accordance with all documentation submitted pursuant to OAC Rule 3745-300-04(0) and approved by the VAP.

DEC 21 2000

Date of Certification

Director, Ohio Environmental Protection Agency

NOV 22 2002

Date of Expiration

Manager, Voluntary Action Program

SCOPE, LIMITATION, OBLIGATIONS AND RESPONSIBILITIES OF CERTIFICATION ON REVERSE SIDE

Commonwealth of Kentucky  
Department for Environmental Protection  
Division of Environmental Services

*Certificate of Laboratory Certification  
for the Chemical Analysis of Drinking Water*

in accordance with 401 KAR Chapter 8, issued to:

**Geo-Analytical, Inc.**  
9263 Ravenna Road, Suite A-7  
Twinsburg, Ohio 44087

for the analytes listed on the most current certified parameter list.

*Scott Bryson*  
*Sharon L. Wheatley*  
Certification Officers

Laboratory ID # 90081

Expires December 31, 2001

**APPENDIX E**  
**TREATABILITY STUDY REPORT**



**1997 FINAL TREATABILITY STUDY  
FOR  
THE MASTER METALS, INC. SITE  
CLEVELAND, OHIO**

**PREPARED BY  
ENTACT, Inc.**

**September 2, 1997**

## 1.0 INTRODUCTION

ENTACT, Inc. conducted a treatability study in 1997 for the Master Metals Technical Committee (MMTC) to obtain information from which to design a stabilization/solidification process that is best suited for treating lead, cadmium, and arsenic contaminated feedstock and soils at the Master Metals Site in Cleveland, Ohio. Based upon information collected during time-critical removal activities, materials present on site contain as much as 155,000 ppm lead. The leachability of the lead in these materials is also very high with TCLP tests performed under the direction of ENTACT showing some levels above 2,000 mg/L. The stabilization/solidification process must reduce the leachability of lead, cadmium, and arsenic to nonhazardous levels. ENTACT performed a bench scale study of treatment alternatives in a manner that replicates the performance of the additives in actual field implementation. The results that are obtained in the laboratory study can be expected for materials that are stabilized in the field.

In addition to rendering the materials nonhazardous, ENTACT directed the treatability study to find the optimum blend of additives, which effectively rendered the soils nonhazardous. An important consideration in determining the optimum blend was finding the minimum amount of additive that would successfully treat the on site materials. Optimization of the additive quantities in the blend will reduce the total amount of additives needed for the project. This minimization of additives will also help to prevent a volume increase in the treated material. The reduction in volume of treated material will reduce handling costs as well as disposal and containment costs. ENTACT has developed a patented blend of additives that significantly reduces the leachability of lead and other heavy metals and also minimizes the amount of treatment reagent added to the material. The additives that ENTACT utilizes are very effective. Materials treated with these additives become stable and resist leaching. The additives have a buffering capacity, which keeps the treated matrix in a pH range that provides long-term durability and reduces the leachability of heavy metal components. These patented additives have been used successfully for treating over 1,000,000 tons of contaminated soil, slag, battery components, and other debris.

## 2.0 AS-RECEIVED MATERIAL ANALYSIS

In July and August 1997, ENTACT collected twelve sample containers containing representative samples of materials from the Master Metals Site. Samples were collected from the on-site soils, drummed waste and feedstock materials. The matrices were collected according to waste streams found on site in the following classifications:

- Gross contamination removed from the concrete slab during remediation activities;
- Refractory brick and debris drummed on site;
- Soil contained in roll off boxes;
- Material originating from furnaces and ball mills;
- White lead waste from drums and super sacks in feedstock area;
- Gray lead powder waste from super sacks in feedstock area;
- Leaded glass in pallet containers and roll off boxes;
- Large gray waste pile near furnace building;
- **Excavated soils from western and southern portions of site;**
- Sample material received on site prior to refining;
- By-products of glazing process (roll off boxes); and
- Drummed solid waste material

These materials were taken to National Environmental Testing Laboratories (NET), of Bartlett, Illinois, for treatability analysis.

Prior to as-received sample analysis, it was determined that materials, being of a heterogeneous nature, would be analyzed as separate waste streams and treated as such. Tests were conducted to determine the total metals concentration and TCLP metals on the one composite sample. These tests established baseline conditions against which treatment additives were evaluated. The results are provided in Table 1.

Total metal concentrations for lead ranged from 12,000 mg/kg to 155,000 mg/kg. As shown in Table 1, all materials exhibited the toxicity characteristic for lead. Toxicity characteristic concentrations for lead ranged from 42.8 mg/L to 2,180 mg/L. Nine of the thirteen waste streams exhibited the toxicity characteristic for cadmium. Toxicity characteristic concentrations for cadmium ranged from less than 0.1 mg/L to 75.3 mg/L. Three of the thirteen waste streams exhibited the toxicity characteristic for arsenic.

Toxicity characteristic concentrations for arsenic ranged from 0.023 mg/L to 15.1 mg/L.

### **3.0 LEAD STABILIZATION**

#### **3.1 Behavior of Lead in Materials**

Lead is the primary contaminant of concern at the Master Metals Site due to its ubiquity in feedstock material, waste piles, and surficial soils (see Table 1). Elemental lead (Pb), lead sulfate ( $\text{PbSO}_4$ ), lead oxide ( $\text{PbO}$ ), and lead dioxide ( $\text{PbO}_2$ ) are the predominant species found. Sites with carbonate soils generally contain lead carbonate ( $\text{PbCO}_3$ ), hydrocerussite ( $\text{Pb}_3(\text{CO}_3)_2(\text{OH})_2$ ), or lead hillite ( $\text{Pb}_4\text{SO}_4(\text{CO}_3)_2(\text{OH})_2$ ). Other heavy metals, such as antimony, arsenic, cadmium, and copper are sometimes present, but normally at relatively low concentrations (Royer, 1992).

Lead is generally not very mobile in the environment, and tends to remain relatively close to its point of initial deposition. Generally, soils tend to retain lead in the upper few centimeters. The capacity of soil to adsorb lead increases with increasing pH, cation exchange capacity, organic carbon, soil/water Eh (redox potential), and phosphate levels. Lead exhibits a high degree of adsorption on clay-rich soil. Lead compounds can also be adsorbed onto hydrous oxides of iron and manganese and thus be immobilized in salts containing two or more cations (Royer, 1992).

In order for chemical fixation/stabilization to be successful, the various forms of lead salts, especially lead oxide, need to be converted to compounds that are particularly insoluble under the normal pH range. Lead is capable of forming the following three low solubility orthophosphate salts:

$\text{Pb}_3(\text{PO}_4)_2$ ,  
 $\text{Pb}_2\text{HPO}_4$ , and  
 $\text{Pb}(\text{H}_2\text{PO}_4)_2$ .

### **3.2 Treatment Technology Description**

The stabilization process, sometimes referred to as immobilization or fixation, uses additives to chemically immobilize the hazardous constituents of a contaminated material by combining the additives and lead-bearing matrix within a mixing device. Additive reagents for use in the stabilization of lead contaminated materials include Portland Cement, calcium oxide, calcium carbonate, fly ash, and proprietary additives (EPA, 1989 and Conner, 1990). Other investigators have documented successful stabilization of lead using combinations of the following compounds: magnesium oxide, magnesium hydroxide, reactive calcium carbonates, reactive magnesium carbonates, and boric acid.

ENTACT has developed a proprietary list of additives for stabilizing waste containing lead and other heavy metals including phosphoric acid, monocalcium phosphate (TSP), monoammonium phosphate, and diammonium phosphate either alone or in combination with Portland Cement.

The listed ENTACT patented compounds provide the necessary environment for successful lead stabilization. The first component is a phosphate ion that reacts with metals such as lead to form a salt which is insoluble under normal environmental conditions. The second component is the phosphoric acid buffer system that provides stability to the treated waste mixture under minor environmental changes.

The stabilization process and ENTACT patented additives provide the necessary components for successful stabilization of lead contaminated soil and debris—small and consistent particle size, a phosphate ion, a buffering system, and thorough mixing.

## **4.0 ADDITIVE DESIGN AND SELECTION**

All thirteen separate samples, representing the waste streams shown in Table 1, were prepared for treatability testing. The percentages of the additive components used in the blend were varied for several trials. The additive blend varied from two percent to ten percent based upon the matrix characteristics. This relatively wide range of additive mixtures is due in part to the heterogeneous nature of materials present on site. After receiving results from this initial treatability study it was determined that some waste streams required the addition of cement along with the phosphate. These materials were treated with blends of 5 percent phosphate-5 percent cement and 5 percent phosphate-10 percent cement.

ENTACT's combination of additives is a proprietary blend of chemical agents which greatly reduces the leachability of metals in the stabilized matrix. The leachability of the metals in the treated matrix will be reduced to nonhazardous levels with an appropriate blend of additives. The leachability of treated materials indicates the effectiveness of the various blends. TCLP tests measured the leachability of lead, cadmium, and arsenic from the matrix following treatment.

### **4.1 Selection of Additive Blend**

Each of the samples was analyzed separately with an initial additive blend mixture of two percent. This mixture was increased in increments of two (i.e., 4%, 6%, etc.) or a blend of cement/phosphate was utilized until the matrix was rendered nonhazardous. The samples containing the selected blends were tested for TCLP metals. The results of these tests are provided in Table 2. As shown in Table 2, all but two of the waste streams were successfully treated to non-hazardous characteristic levels. The determination was made based on the developing trend for SDY-05 and SDY-10 that the material could not be treated without a substantial addition of additive. Therefore, it was determined that these two

waste streams would not be treated on site. Instead, these materials will be consolidated into roll-off boxes and disposed of as hazardous waste.

Eight of the waste streams were treated successfully with a phosphate treatability of 4-8 percent by weight. Of these, the excavated soils were successfully treated with a phosphate treatability of 4-6 percent. Only three or four waste streams required a treatability blend of phosphate/cement.

ENTACT has used similar additive blends (the same constituents in different proportions) at numerous heavy metal contaminated sites. ENTACT additives offer a very high degree of consistency and reliability resulting in uniform performance characteristics.

## **5.0 CONCLUSIONS**

ENTACT's selected blends of additives were successful in stabilizing the lead contaminated materials in eleven of the thirteen waste streams present at the Master Metals Site. The average TCLP level for lead was reduced from approximately 922 mg/L, to about 3 mg/L, a reduction of more than 99.6%. A similar reduction in TCLP levels for cadmium (98.1%) and arsenic developed from the addition of the cement to the treatability samples. Based upon total metals results, materials on site with like lead concentrations may be mixed prior to treatment to consolidate waste streams and provide effective processing of the waste materials and treatability reagents.

Two blends of additive will be utilized to treat contaminated material at the Master Metals Site - phosphate blend and phosphate/cement blend. For soils, the 4% phosphate blend additive was effective in rendering the soils nonhazardous and did not require the addition of cement. The chosen blends of additives met all requirements of the treatability study. The blends result in a minimal addition of material to the contaminated waste stream, which will help prevent a volume increase after compaction in the final disposal location. The durability of the final remedy is assured over the long term as a result of the pH buffering capacity of the additives. The ENTACT blend offers better performance for the requirements of land disposal of contaminated materials as compared with other additives.

## **6.0 REFERENCES**

Conner, Jessie R., Chemical Fixation and Solidification of Hazardous Waste, Van Nostrend Reinhold (1990).

Royer, Michael D., Ari Selvakumar and Roger Gaire. "Control Technologies for Remediation of Contaminated Soil and Waste Deposits at Superfund Lead Battery Recycling Sites," J Air Waste Management Association, Volume 42, Number 7, pp. 970-980 (1992)

United States Environmental Protection Agency, August 1991, "Handbook Stabilization Technologies for RCRA Corrective Actions," (EPA/625/6-91/026), Office of Research and Development, Washington, DC.

**Table 1**  
**Analysis of Material Samples As-Received**

Sample ID	Description	Total Metals Concentration (mg/kg)			TCLP Metals Result (mg/L)		
		Pb	Cd	As	Pb	Cd	As
SDY-01	gross surface contamination	89,000	1,500	1,300	1,390	55.5	<2.0
SDY-02	refractory brick	80,000	188	<500	2,180	1.26	15.1
SDY-03	soil-roll off	56,000	89	154	52.0	-	-
SDY-04	furnace/ball mill materials	86,000	3,400	545	42.8	75.3	-
SDY-05	gray powder	75,000	3,440	<500	782	51.2	5.15
SDY-06	white lead powder	70,000	<25	<500	1,210	0.045	8.59
SDY-07	leaded glass	12,000	-	-	177	<0.010	<2.0
SDY-08	dark gray waste pile	48,000	110	180	840	1.38	0.023
SDY-09	on site soil-excavated	17,000	61	220	1,400	3.54	0.0899
SDY-09-2	on site soil-excavated	77,000	68	230	508	2.72	< 2.0
SDY-10	refining samples	84,000	18	430	1,090	< 0.10	< 2.0
SDY-11	glazing by-product	155,000	320	380	1,900	3.86	<2.0
SDY-12	drummed solid waste material	100,000	630	750	620	6.89	<2.0

**Table 2**  
Analysis of Selected Blends

<u>Sample ID</u>	<u>Treatment</u>	<u>Description</u>	<u>Total Metals (ug/g)</u>			<u>TCLP Metals (mg/L)</u>			<u>soil pH</u>
			Pb	Cd	As	Pb	Cd	As	
<b>SDY-01</b>		gross surface contamination	96,000	1,500	1,300	1,390	55.5	<2.0	6.99
	2%	treatment reagent added				1,340	-	-	6.9
	4%	treatment reagent added				577	-	-	6.7
	6%	treatment reagent added				194	-	-	6
	8%	treatment reagent added				114	-	-	-
	5%-5%	treatment blend added				9.36	2.44	<2.0	
	10%-5%	treatment blend added							
<b>SDY-02</b>		refractory brick	80,000	188	< 500	2,180	1.26	15.1	7.1
	2%	treatment reagent added				1,050	-	-	6.41
	4%	treatment reagent added				966	-	-	3.92
	6%	treatment reagent added				3.57	-	-	4.32
<b>SDY-03</b>		roll off boxes of soil/gravel	56,000	89	154	52	-	-	7.66
	2%	treatment reagent added				1.51	-	-	5.65
	4%	treatment reagent added				1.08	-	-	6.42
	6%	treatment reagent added				0.509	-	-	4.92
<b>SDY-04</b>		furnace and ball mill material	86,000	-	-	42.8	75.3	-	7.21
	2%	treatment reagent added				61.9	27.6	-	6.44
	4%	treatment reagent added				49.2	28.8	-	5.22
	6%	treatment reagent added				4.03	10	-	5.71
<b>SDY-04-2</b>		furnace and ball mill material	65,000	3,400	-	30.8	130	-	6.44
	8%	treatment reagent added				5.44	31.7	-	-



**Table 2**  
Analysis of Selected Blends

<u>Sample ID</u>	<u>Treatment</u>	<u>Description</u>	<u>Total Metals (ug/g)</u>			<u>TCLP Metals (mg/L)</u>			<u>soil pH</u>
			Pb	Cd	As	Pb	Cd	As	
	15%	treatment reagent added				2.01	1.97	1.59	4.57
	10%-5%	treatment blend added				< 0.80	< 0.050	< 2.0	10.01
<b>SDY-05</b>		gray powder (supersacks)	75,000	-	-	782	51.2	5.15	6.55
	2%	treatment reagent added				557	-	-	6.49
	4%	treatment reagent added				537	-	-	6.42
	6%	treatment reagent added				530	-	-	6.45
<b>SDY-06</b>		white powder (drums & supersacks)	70,000	< 25	< 500	1,210	0.045	8.59	11.38
	2%	treatment reagent added				27.7	-	-	12
	4%	treatment reagent added				5.4	-	-	11.57
	6%	treatment reagent added				1.42	-	-	9.96
<b>SDY-07</b>		lead glass material	12,000	-	-	1.26	<0.10	<2.0	5.67
	2%	treatment reagent added				16.2	-	-	3.25
	4%	treatment reagent added				< 0.800	-	-	2.85
	6%	treatment reagent added				3.28	-	-	2.95
	8%	treatment reagent added				4.27	-	-	-
<b>SDY-08</b>		dark gray waste pile	48,000	110	180	840	1.38	0.0226	6.78
	2%	treatment reagent added				900	4.09	-	-
	4%	treatment reagent added				4.34	0.286	-	-
	6%	treatment reagent added				1.42	0.172	-	-

**Table 2**  
Analysis of Selected Blends

Sample ID	Treatment	Description	Total Metals (ug/g)			TCLP Metals (mg/L)			soil pH
			Pb	Cd	As	Pb	Cd	As	
SDY-09		excavated soil from on site	17,000	61	220	1400	3.54	0.0899	6.17
	4%	treatment reagent added				877	1.47	-	-
	6%	treatment reagent added				408	1.32	-	-
	8%	treatment reagent added				45.8	1.11	-	-
SDY-09-2		excavated soil from on site	77,000	68	230	508	2.72	< 2.0	5.22
	2%	treatment reagent added				18.9	-	-	5.53
	4%	treatment reagent added				1.50	-	-	5.64
	6%	treatment reagent added				4.06	-	-	5.02
SDY-10		composite of 2 gal sample buckets	84,000	18	430	1,090	< 0.10	< 2.0	8.92
	6%	treatment reagent added				961	-	-	7.68
	8%	treatment reagent added				556	-	-	6.51
	10%	treatment reagent added				356	-	-	6.17
SDY-11		roll off boxes of glazing by-product	155,000	320	380	1,900	3.86	<2.0	7.04
	10%	treatment reagent added				122	2.29	< 2.0	5.06
	5%-5%	treatment blend added				92	1.95	<2.0	8.84
	10%-5%	treatment blend added				9.64	<0.050	<2.0	11.14
SDY-12		solid drummed material (dross, etc)	100,000	630	750	620	6.89	<2.0	6.19
	10%	treatment reagent added				293	4.86	<2.0	6.92
	5%-5%	treatment blend added				110	0.19	<2.0	7.7
	10%-5%	treatment blended added				0.125	0.022	<2.0	9.15

**APPENDIX F**  
**FINAL EROSION CONTROL PLAN**

# Master Metals, Inc. Site EROSION CONTROL PLAN

## SITE DESCRIPTION

Master Metals, Inc. Site  
Cuyahoga County  
Cleveland, Ohio

Address

The goal of the Master Metals, Inc. (MMI) Erosion Control Plan is to implement the baseline best management practices (BMPs) for controlling surface run-off and sediment erosion during construction activities. The Construction Project Manager will ensure these practices are being followed, including completion of inspection logs and assisting with sampling activities. The ECP will be updated when the nature of on-site activities changes substantially, or information indicates a possible problem in data collection.

The team for the construction activities at the MMI Site is:

**Leader:** Bob Ainslie **Title:** ENTACT Field Project Manager

**Stormwater Responsibilities:** Coordinate preparation and implementation of plan; coordinate employee-training programs; coordinate record keeping; and ensure inspections are performed.

**Member:** ENTACT tech **Title:** On-Site QA/QC Officer

**Stormwater Responsibilities:** Coordination of ENTACT plans with master plans, coordinate with the Site-wide Stormwater Inspector and the Site-wide Stormwater Administrator. Note any on-site changes that may affect plan; conduct inspections. Has reviewed the ESCP and is familiar with the following: the location and type of control measures, the construction requirements for the control measures, the maintenance procedures for each of the control measures, spill prevention and cleanup measures, and inspection and maintenance record keeping requirements. Mr. Cronk has performed similar operations and been responsible for these functions at projects of this size and larger.

The construction activities at the MMI Site are being conducted pursuant to a Administrative Order of Consent (AOC) agreed to on September 25, 2003 between the Potentially Responsible Parties (PRPs) and United States government and filed under Sections 106(a), 107 and 122 of the Comprehensive Environmental Response, Compensation and Liability Act and the Statement of Work (SOW).

The SOW required excavation of approximately 1,800 to 3,600 cubic yards of lead-impacted soils along the perimeter of the site for on-site stabilization to render the soils nonhazardous. Soils will be excavated until the risk-based remediation goal of 1,000 mg/Kg is reached or until historic slag is encountered, whichever comes first

The treated material and the stockpiled stabilized soils from the Holmden Avenue removal action not used to fill depressions beneath a constructed asphalt cover system will be transported off-site for disposal at the approved Subtitle D landfill. All excavation areas and all areas disturbed by construction will be backfilled with suitable clean fill that meets the performance standards outlined in the FSAP, graded to provide positive drainage, and to

control any additional ponding of water that may occur during implementation of the remedy.

Any necessary drainage ditches, drainage swales, and erosion control methods will be provided to prevent surface runoff during construction from eroding the final grade or flowing off-site

The scope of work for the remedial action includes the following major construction activities:

- Clear and grub areas requiring excavation of all trees and dispose of off-site.
- Excavation of lead-impacted soils on-site that are not under concrete or the asphalt cover, nor addressed during that Phase I TCR, and off-site soils along the western, eastern and southern perimeter of the MMI facility, that exceed the RBRG of 1,000 mg/Kg or until historic slag fill material is encountered, whichever comes first. XRF screening technology will be used to guide depth of the excavations during removal.
- Backfill all excavated areas determined to have met the RBRG or have reached historic slag fill, with clean imported fill material that has been approved for use based on analytical results.
- Stabilization of excavated on-site and off-site impacted soils to achieve a Toxicity Characteristic Leaching Potential (TCLP) value of less than 5.0 mg/L lead that will meet the applicable LDRs for contaminated soils (<7.5 mg/L) and render the material nonhazardous (<5.0 mg/L).
- Off-site disposal of all treated soils, including stockpiled soils from the Holmden Properties Removal Action not used to fill depression beneath the asphalt cover.
- Construction of a minimum 4-inch thick asphalt cover over the deteriorated concrete in the southern portion of the site.
- Recondition existing concrete surfaces not under the asphalt cover by sealing any significant cracks or deteriorated areas that extend through the concrete surface, followed by encapsulation of the concrete surface, in accordance with the SOW and approved design plan.
- 
- Removal of any existing solid waste including Investigative Derived Waste (IDW) from previous or current removal actions.
- Monitoring air, ground water and sediment monitoring during the RA.
- Installation of dust and storm water controls during the implementation of the RA;
- Site restoration;
- Initiation of Operation and Maintenance Plans at the site.

A project schedule of the major activities to be conducted at the site is provided in Figure 6-1 in the RA Workplan.

	<p>The MMI Site is an approximately 4.3-acre lot in an industrial area of Cleveland. The site is flat, predominantly covered with concrete. All former buildings, except the roundhouse and adjoining office buildings have been razed. Remaining areas requiring excavation are located along the site perimeter. An asphalt cover system will be constructed in the southern half of the property in accordance to the design specifications. See Figure 4-1 of the RD/RA Workplan showing topography and proposed cover system location.</p>
<p><b>Site Drainage System</b></p>	<p>Existing on-site catch basins connecting to the municipal sewer system that could be opened have been determined to be functional. The locations are presented in the design specifications. Remaining sewers that are labeled "could not be opened" in the design drawings will be opened and inspected as part of the removal action activities. The sewers located in the south-central portion of the site is the access for a 36-inch diameter line flowing east to west. Two eight-inch clay tiles connect to the main line of this manhole. One flows into the 36-inch line from the north and the other flows into the 36-inch line from the southwestern direction. Surface water drainage is sloped toward the existing on-site sewers, with some uncontrolled stormwater run-off collecting in a low-lying area located in the central portion of the site. In accordance to the design specifications, grading of the proposed asphalt cover will direct surface run-off on property to the existing catch basins.</p>
<p><b>Areas Potentially Receiving Surface Water Runoff from Site</b></p>	<p>The drainage on-site is directed toward stormwater catchment basins. All sumps that were present on site were cleaned out as part of the Phase I TCR and will be backfilled and covered as part of the RA. The B&amp;O Railroad embankment along the western boundary of the site and West 3<sup>rd</sup> Street to the south and east provide manmade barriers to off-site migration.</p>
<p><b>Site Map</b></p>	<p>All pertinent surrounding features, including water resources, topography, and drainage patterns and facilities are illustrated in Figure 1-2 of the RD/RA Workplan</p>
<p><b>Soil Types</b></p>	<p>The soils underlying the site consist primarily of fill materials (i.e., cinders, slag, sand) and reworked native silt and clay soils. The native soils are glacial till consisting of silt, clay and sand. On-site boring logs indicate that a sand or a sandy clay fill material with some construction debris ranges in depth between two to four feet and overlies a historic slag and cinder fill.</p>
<p><b>Name of Receiving Waters</b></p>	<p>There are no existing surface water bodies on-site. The nearest surface water body is the Cuyahoga River, located 1,300 feet east of the site. It is unlikely that run-off from the site could reach the river due to intervening natural and manmade barriers in this heavy industrialized area of the city.</p>

## CONTROLS

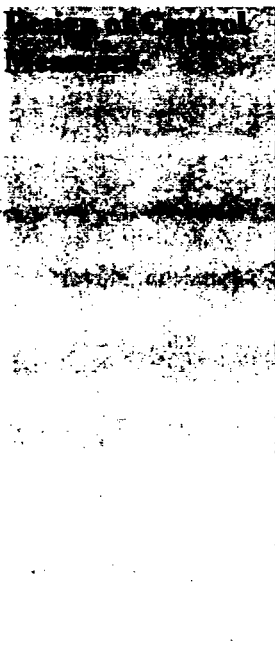
### Erosion and Sediment Controls

#### Short and Long Term Control and Criteria

Erosion and sediment controls consist of measures to divert upslope water around disturbed areas, to maintain all site drainage within the excavation area, and to remove sediment from storm water before it reaches the storm sewer system. During all phases of construction, care will be taken to minimize the disturbed area, and to stabilize disturbed areas as soon as possible. The control measures to be implemented as part of this ECP include:

- Berms surrounding the stockpile area; and
- Stabilized construction entrances.

Ground to be disturbed in the MMI site will drain back into the excavations since the streets and adjoining sidewalks are constructed above grade. ENTACT will limit the time of exposure of disturbed areas by expedited construction schedule and installation of temporary vegetation 14 days after completion of the project. If further construction activities are scheduled for the site within 21 days after project completion, there will be no installation of temporary vegetation. ENTACT is responsible for implementation of these controls.



The erosion and sediment controls are designed to retain sediment on-site to the extent practicable during excavation activities. The controls will be installed according to manufacturer's instructions and according to good engineering practices.

As required by Ohio Administrative Code 1501: 15-1-04(A)(12), all temporary erosion and sediment control measures will be dismantled within thirty (30) days after final site stabilization is achieved or after the temporary practices are no longer needed, unless otherwise authorized by the approving agency. Trapped sediment will be permanently stabilized to prevent further erosion.

As required by Ohio Administrative Code 1501: 15-1-04(A)(11), a permanent vegetative cover must be on denuded areas not otherwise permanently stabilized and will not be established until ground cover provides adequate cover and is mature enough to control soil erosion satisfactorily and survives adverse weather conditions.

Off-site accumulations of sediment will be removed weekly to minimize off-site impacts.

The treatment containment area will be constructed prior to clearing or grading of any portion of the site. The 12-inch to 18-inch berms surrounding the stockpile area will be constructed before any stockpiling activities commence. Areas where construction activity ceases for more than 21 days will be stabilized with temporary seed and mulch within 14 days of the last disturbance. Once construction activity ceases permanently in an area, that area will be stabilized with permanent seed and mulch. After the entire site is stabilized, the accumulated sediment will be removed and silt fences will be removed.

**Waste Materials:** All non-hazardous construction debris and general office trash will be disposed in a roll-off or dumpster placed in the support zone. Trash receptacles will be placed in the storage trailer and office trailer for the collection of non-hazardous trash and debris. Spent personal protective equipment will not be disposed with non-hazardous trash.

**Hazardous Materials:** Previous investigation information has identified two categories of materials that will be excavated during remediation activities: topsoil, and impacted fill material. Each material type will be staged in designated storage areas. Stockpiled areas will be covered to prevent erosion and storm water runoff. A 12-inch to 18-inch berm will be constructed surrounding the stockpile area. Collected storm water will be sampled, treated, (if necessary), and discharged into storm drains or used in dust suppression.

### Site Stabilization

Within 14 days of completion of excavation, backfilling and final grading activities in each excavation area of the site, the site will be stabilized. All sediment control devices located at storm inlets will remain in place and will be maintained. If other construction activities will commence sooner than 21 days after final grading in an area, then no stabilization will be completed.

The following records will be maintained and attached to the ESCP:

- the dates when major grading activities occur;
- the dates when construction activities temporarily or permanently cease on a portion of the site; and,
- the dates when stabilization measures are initiated.

The site is predominately covered with concrete. Areas not covered with concrete requiring excavation are covered with grass. After the remedy is completed, excavated areas will be re-graded and re-vegetated. This action will cause the peak rates of run-off before development to be less after the construction is completed, as required pursuant to Ohio Administrative Code 1501:15-1-05

Designs for future construction and associated stormwater control structures have not been finalized. Operation and maintenance of these controls will be transferred to the Site-wide Stormwater Administrator upon completion of stabilization activities.



No solid materials, including building materials, will be discharged directly to waters of the United States. Therefore, no permit issued under section 404 of the CWA is required.

A stabilized construction entrance has been provided to help reduce vehicle tracking of sediments. The entrance will be swept, as needed, to remove any excess mud, dirt or rock tracked from the site. All vehicles hauling waste materials from the project site will be tarped.

Off-site discharge will be coordinated with the Northeast Ohio Regional Sewer District (NEORSDD).

Hydraulic oils, motor oils and lubricants will be stored in the on-site equipment storage trailer. Quantities of these items should not exceed 10 gallons. If larger quantities of these items are required to be on-hand, ENTACT will review the storage and containment of those items at such time.

Pollution prevention measures will include implementation of best management practices (BMPs). If a reportable quantity of oil or hazardous material release is discovered, ENTACT will notify the National Response Center 800/424-8802 immediately. The Ohio Environmental Protection Agency (OEPA) will be notified verbally within 24 hours and in writing within 14 days. Complete emergency response and spill cleanup procedures are detail in the Site Specific Health & Safety Plan. The ESCP will also be modified to include:

- the date of the release;
- circumstances leading to the release; and
- steps taken to prevent reoccurrence of the release.

The site is inactive so there are no other pollutant sources in the form of other industrial operations.

This ECP will be updated as necessary to remain consistent with site changes and/or regulation changes that affect stormwater management at the site.

## **MAINTENANCE / INSPECTION PROCEDURES**

Maintenance of the storm water controls has been identified as a major part of effective erosion and sediment programs. ENTACT will perform inspections at least once every 14 calendar days and within 24 hours of any storm event of greater than 0.5 inches. The Field Project Manager will perform inspections and the inspection reports will be maintained. The Field Project Manager will inspect disturbed areas and areas used for storage of materials that are exposed to precipitation for evidence of, or the potential for, pollutants to enter the runoff from the site. Erosion and sediment controls will be inspected to ensure they are functioning properly and that they are positioned adequately for the control of runoff and sediment. Storm water inlets will be inspected for evidence of sediment accumulation or flow restriction. Locations where vehicles enter or exit the site will be inspected for evidence of offsite sediment tracking. Based on the results of the inspection, the pollution prevention measures will be revised as soon as possible, not less than 7 days, after inadequacies are revealed. The inspection reports will be retained as part of the Storm Water Pollution Prevention Plan for at least three years after the date of inspection.

## **NON-STORMWATER DISCHARGES**

ENTACT will control transient dust through active use of water-based control methods. These include high-pressure water misting units placed in and around excavation work areas. The misting units will be used to control fugitive emissions in active work areas.

## EROSION AND SEDIMENT CONTROL PLAN INSPECTION AND MAINTENANCE RECORD

1. Inspections to be performed bi-weekly & within 24 hours of a rainfall of 0.50" or greater;
2. Inspect storm water drainage areas for evidence of pollutants entering the drainage systems;
3. Evaluate the effectiveness of controls and best management practices (good housekeeping activities, preventive maintenance practices, etc.)
4. Observe structural measures, sediment controls, vegetative cover and other storm water best management practices to ensure proper function or proper condition;
5. Revise the plan as needed within 1 week of inspection and implement any necessary physical changes within 1 week of inspection;

OBSERVATIONS:

Inspected by:

Date:

\_\_\_\_\_

\_\_\_\_\_

**APPENDIX G**

**FINAL COMMUNITY RELATIONS PLAN**

**FINAL COMMUNITY RELATIONS PLAN**

**FOR  
THE MASTER METALS, INC. SITE  
CLEVELAND, OHIO**

**PREPARED BY  
ENTACT, Inc.**

**January, 2003**

**Appendix G**  
**Final Community Relations Plan**  
**Master Metals, Inc. Site**  
**Cleveland, Ohio**

**TABLE OF CONTENTS**

1.0	COMMUNITY RELATION PLAN .....	1
1.1	Overview of Community Relations Plan .....	1
1.2	Site Location and Description.....	1
1.3	Site History .....	2
1.4	Description of Remedial Action .....	3
1.5	Highlights of Program.....	5
1.6	Documents Available for Public Review.....	5
1.7	Information Repositories .....	6
1.8	List of Contacts .....	6

## **1.0 COMMUNITY RELATIONS PLAN**

### **1.1 Overview of Community Relations Plan**

The development and implementation of community activities are the responsibility of the US EPA. The key community relation activities were documented in a Community Relations Plan prepared by USEPA, April 1999. All MMI PRP-conducted community relation activities will be subject to oversight by the USEPA, in coordination with Ohio EPA.

During the Public Comment Period of 1999, a request was made to USEPA, Ohio EPA and the Respondent Group by the City of Cleveland's Economic Development Office on the behalf of Northern Ohio Lumber and Timber Company (NOLTCO) to consider the possibility of returning the Master Metals facility back to productive use. The Action Memorandum (the clean up remedy decision document) was approved September 1999. Although protective of human health and the environment, the clean up remedy was unsuitable for NOLTCO's reuse of the facility. Therefore, another Action Memorandum for the non-time critical removal action was approved for the Master Metals Site. The first Action Memorandum of September 1999 for the non-time critical removal action was to excavate and treat the soils and consolidate the treated soils on-site underneath a geo-membrane and vegetative soil cover. The second and final Action Memorandum, September 2000, was approved to change the project scope from a geomembrane and vegetative soil cover to an asphalt cover to accommodate the redevelopment site by NOLTCO. Following the long negotiations between all of the interested stakeholders, an agreement was reached and the AOC for the Non-Time Critical Removal Action became effective on September 25, 2002.

An updated Overview of Community Relations Plan is presented here. The Plan contains the following sections:

- Site Description
- Description of the RA
- Highlights of Program
- Documents Available for Public Review
- List of Contacts
- Information Repository

### **1.2 Site Location and Description**

The MMI Superfund Site (the "Site") covered under the AOC includes the former MMI lead facility (the "Facility") located at 2850 West Third Street, Cleveland, Cuyahoga County, Ohio and an on-site stockpile of treated lead-impacted soils from a 1997 removal action of contaminated soils at 1157, 1159 and 1167 Holmden Avenue (the "Holmden Properties") where lead-impacted material from Master Metals was deposited as fill (USEPA, 1999). The site is situated in Township 7 North, Range 12 West, Section 17, ¼ NE, ¼ SW, ¼ SW, with coordinates obtained from the Facility Index System (FINDS) listed as 41 degrees, 28 minutes, 26

seconds latitude and -81 degrees, 40 minutes, 31 seconds longitude.. The site location is illustrated in Figure 1.

The Master Metals Inc. (MMI) property is a triangular-shaped parcel encompassing approximately 4.3 acres in the "flats" area of downtown Cleveland, a heavily industrialized sector of the city. The site is bordered on west by rail yards owned by the Baltimore & Ohio (B&O) Railroad, the east by West Third Street and B&O railroad tracks, and on the south by a dead-end road and an abandoned industrial property. LTV Steel owns the property to the south and north. The Cuyahoga River is located approximately 1,250 feet east of the facility and flows north toward Lake Erie (ENTACT, 1999). An athletic field and playground are situated approximately 1,000 feet to the west. The nearest residential property to the former facility is approximately 2,000 feet to the northwest (USEPA, 1999).

Major site features, prior to a 1997-1998 time-critical removal (TCR) action, included an office building, a secondary lead smelting furnace building, two large brick baghouses, the roundhouse building, storage buildings, material storage bins and boxes, and an aboveground storage tank farm (ENTACT, 1998). All buildings, except for the roundhouse and the attached office building in the northern corner of the property, have been razed as part of the Phase I TCR (ENTACT, 1998) and all remaining feedstock and debris materials were decontaminated and/or treated and disposed of off-site as either special waste or as hazardous waste (ENTACT, 1998). The MMI facility property is currently vacant with the exception of the roundhouse, and the majority of the land surface covered with concrete or asphalt except along the site boundaries. Current site features are illustrated in Figure 2.

### 1.3 Site History

The facility was constructed in 1932 on slag fill by National Lead Industries, Inc. (NL) who owned and operated the facility as a secondary lead smelter, producing lead alloys from lead-bearing dross and scrap materials. NL Industries also engaged in battery cracking operations at this facility. In 1979, the facility was purchased from NL Industries by Master Metals who continued to run secondary lead smelter operations (USEPA, 2001a).

As part of their operations, the Master Metals facility received lead-bearing materials classified and regulated under Resource Conservation and Recovery Act (RCRA) as D008 hazardous waste from off-site sources (USEPA, 2001a). This waste was converted into lead ingots using pot and rotary furnaces equipped with baghouses to collect particulate matter from the furnace that consisted predominantly of lead dust. The sludge that accumulated in the furnaces after smelting was classified as K069 waste hazardous waste. Finished lead ingots were stored in a roundhouse at the north end of the property prior to shipment off-site.

Based on background information, the by-products produced from smelting operations included furnace flux, slag, dross, baghouse fines and furnace sludge (USEPA, 2001a). With the exception of slag, which was tested and disposed of off-site, most of the lead-bearing by-products were recycled back into the furnace. Cooling water used in the operations was diverted to a combined sewer system operated by the NEORD (ESC, 1991).

Violations relating to noncompliance and poor operating practices are documented in various state and federal agency reports, summarized in the Section III of the AOC, presented in Appendix A of the RD/RA Workplan. In January of 1992, the OEPA installed three ambient air



monitors near the facility property and quarterly air sampling from the station immediately downwind of the facility showed repeated exceedence of the Clean Air Act's 42 USC National Ambient Air Quality Standard (NAAQ) for lead. MMI installed a sprinkling system in July 1992 in an attempt to prevent air-borne migration of the dust from the facility (USEPA, 2001) but exceedences of the NAAQ for lead continued to be measured downwind of the facility. On September 9, 1992, MMI conducted a thorough cleaning of the facility in another attempt to minimize the effects of wind-blown facility dust.

On August 5, 1993, as a result of continuing RCRA violations, the Ohio EPA Director ordered MMI to cease operating the facility until it could demonstrate compliance (USEPA, 2001a). Operations never did resume at the MMI facility and Bank One of Ohio took possession of all MMI cash collateral and accounts receivable. The current property owner remains MMI. The former facility president, Mr. Douglas Mickey, is deceased (USEPA, 2001).

Following shutdown, MMI and the USEPA continued negotiations to resolve RCRA noncompliance issues. On March 28, 1995 the USEPA RCRA Division deferred the MMI Site to CERCLA for cleanup. On August 22, 1995, MMI withdrew all permits still in effect regarding its operation terminating its ability to legally treat, store or dispose of hazardous waste at the facility (USEPA, 2001a). Fifty-three potentially responsible parties (PRP Respondent Group) signed an Administrative Order by Consent for the MMI facility that became effective April 17, 1997. The Order required the PRPs to conduct a Phase I TCR action and a Phase II Engineering Evaluation and Cost Analysis (EE/CA) for a non-time critical removal action for the facility pursuant to the National Contingency Plan (NCP) and the Superfund Accelerated Cleanup Model (SACM) guidance.

In accordance with the April 17, 1997 AOC Docket No: V-W-97-C both the Phase I TCR and Phase II EE/CA have been completed by ENTACT on behalf of the PRP Respondent Group, as described in Section 1.4 of this Workplan.

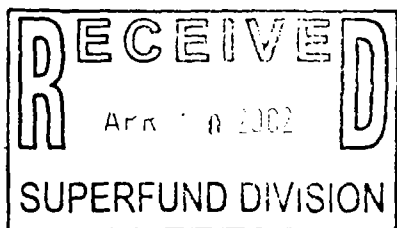
#### **1.4 Description of Remedial Action**

Based on the findings of the Phase II EE/CA, an Action Memorandum was signed by the USEPA on September 22, 2000 and an AOC was entered into between the USEPA and the PRP Respondent Group on September 25, 2002 to perform a non-critical removal action outlined in the Statement of Work (SOW) to address remaining lead impacts at the site that are associated with former facility operations.

The removal action includes the following tasks:

- Clear and grub areas requiring excavation of all trees and brush for disposal off-site.
- Demolish above-grade concrete and metal structures remaining on-site after the Phase I TCR demolition activities in accordance to the design specifications. Sized concrete construction debris will either be used as a sub-base material in areas to be covered with the asphalt cover or will be transported off-site disposal as construction debris. All wood, bricks or metal debris that are removed will be disposed of off-site as construction debris.
- Establish a coordinate grid system along the perimeter of the property outside the fence line and in on-property areas where excavation is required.

- Excavate off-property soils along the western, eastern and southern perimeter of the MMI facility, that exceed the RBRG of 1,000 mg/Kg or until historic slag fill material is encountered, whichever comes first. XRF screening technology will be used to guide the depth of the excavations during removal.
- Excavate designated on-property soils that are not under concrete or the proposed asphalt cover (including grids I1, J1 and K1 excavated during the Phase I TCR) that exceed the RBRG of 1,000 mg/Kg or until historic slag fill material is encountered, whichever comes first.
- Conduct confirmatory soil sampling from the excavation floor in grids where the excavation was terminated prior to reaching the historic slag fill material to confirm that all soils that are above the cleanup level have been excavated and removed.
- Backfill all excavated areas once verified to have met the RBRG or have reached historic slag fill, and grading to promote positive drainage in accordance with the design documents. Backfill for areas not covered by asphalt or concrete will be filled with clean imported fill material that has been approved for use based on analytical results and is suitable to maintain vegetative growth.
- Stabilize excavated soils to meet the applicable LDRs for contaminated soils for lead, and any underlying hazardous constituent (UHC) during waste profiling, to render the material nonhazardous for either use as fill in low areas beneath the proposed asphalt cover or for off-site disposal at an approved Subtitle D facility.
- Conduct verification sampling of treated soils using TCLP lead analysis to verify the material has been rendered non-hazardous for lead prior to either placement in low areas beneath the proposed asphalt cover or for off-site disposal as nonhazardous waste.
- Off-site disposal of all treated soils not used to fill low areas beneath the proposed asphalt cover, including stockpiled soils from the Holmden Properties Removal Action, in accordance with the SOW and the approved design plan.
- Place an asphalt cover over the deteriorated area of the concrete and non-concrete areas located in southern portion of the site in accordance with the design documents. The base course under the asphalt in the non-concrete areas (pits and brick road) will conform to ODOT specifications for pavement design and rehabilitation in accordance with the Final Design Documents.
- Recondition existing concrete surfaces not under the asphalt cover by sealing any significant cracks and breaks that extend through the concrete surface, followed by encapsulation of the concrete surface, in accordance with the approved design plan.
- Abandon of all existing monitoring wells on site in accordance to applicable State of Ohio regulations (OAC-3745-9-10).
- Remove any existing solid waste including Investigative Derived Waste (IDW) from previous or current removal actions.



**Final RD/RA Workplan  
Master Metals Site  
Cleveland, Ohio**

**TABLE OF CONTENTS**

<b><u>Section</u></b>	<b><u>Page</u></b>
<b>1.0 PROJECT DESCRIPTION .....</b>	<b>1</b>
1.1 PURPOSE AND OBJECTIVES.....	1
1.2 SITE LOCATION AND DESCRIPTION .....	1
1.3 SITE HISTORY.....	2
1.3.1 MMI Facility.....	2
1.3.2 Holmden Properties .....	4
1.4 PREVIOUS REMOVAL ACTIONS .....	4
1.4.1 Phase I Time Critical Removal Action .....	4
1.4.2 Phase II Engineering Evaluation/Cost Analysis .....	5
1.5 ADMINISITRATIVE ORDER OF CONSENT .....	7
<b>2.0 PROJECT ORGANIZATION AND MANAGEMENT .....</b>	<b>9</b>
2.1 PROJECT ORGANIZATIONAL CHART .....	9
2.2 MANAGEMENT RESPONSIBILITIES.....	9
2.3 QUALITY ASSURANCE RESPONSIBILITIES .....	10
<b>3.0 SCOPE OF WORK TASKS .....</b>	<b>12</b>
3.1 INTRODUCTION AND OUTLINE OF TASKS.....	12
3.2 TASK 1 - WORK LAN AND SUPPORTING PLANS .....	13
3.2.1 Performance Standard Verification Plan (PSVP) .....	13
3.2.2 Field sampling and Analysis Plan (FSAP) .....	13
3.2.3 Quality Assurance Project Plan (QAPP).....	13
3.2.4 Treatability Study Report.....	14
3.2.5 Erosion Control Plan (ECP).....	14
3.2.6 Community Relations Plan (CRP).....	14
3.2.7 Health and Safety Plan (HASP).....	14
3.2.8 Contingency Plan (CP) .....	14
3.3 TASK 2 - DESIGN PHASES .....	15
3.3.1 Construction Quality Assurance Project Plan (CQAPP) .....	15
3.3.2 Project Schedule.....	15
3.3.3 Truck Route .....	15
3.4 TASK 3 - REMEDIAL ACTION AND CONSTRUCTION.....	15
3.5 TASK 4 - OPERATIONS & MAINTENANCE.....	15
<b>4.0 REMEDIAL ACTION AND CONSTRUCTION .....</b>	<b>16</b>
4.1 PRECONSTRUCTION INSPECTION AND MEETING .....	16
4.2 MOBILIZATION AND SITE PREPARATION.....	16

**Final RD/RA Workplan  
Master Metals Site  
Cleveland, Ohio**

**TABLE OF CONTENTS continued**

<b><u>Section</u></b>		<b><u>Page</u></b>
	4.2.1 Stormwater Control Measures .....	17
	4.2.2 Staging and On-site Treatment .....	17
	4.2.3 Air Monitoring .....	18
	4.2.4 Dust Suppression/Engineering Controls .....	18
	4.2.5 Subsurface Utilities and Other Obstructions.....	18
	4.2.6 Site Security .....	18
	4.2.7 Establishment of Coordinate Grid System.....	19
4.3	CLEARING OF SITE.....	19
4.4	DEMOLITION OF CONCRETE STRUCTURES.....	19
4.5	EXCAVATION, CONSOLIDATION AND TREATMENT .....	19
4.6	CONSTRUCTION OF ASPHALT COVER.....	20
4.7	REFURBISHMENT OF EXISTING CONCRETE SURFACE .....	21
4.8	MONITORING WELL ABANDONMENT .....	21
4.9	BACKFILLING AND SITE RESTORATION .....	22
4.10	TRANSPORTATION AND DISPOSAL OF EXCAVATED MATERIAL .....	23
4.11	CLEAN-UP AND DEMOBILIZATION.....	23
<b>5.0</b>	<b>WORK PRODUCTS .....</b>	<b>24</b>
5.1	DAILY, WEEKLY AND MONTHLY REPORTING .....	24
5.2	EMERGENCY NOTIFICATION .....	24
5.3	PHOTOGRAPHIC DOCUMENTATION.....	24
5.4	REMEDIAL ACTION SUBMITTALS.....	25
5.5	INSPECTION MEETINGS .....	25
5.6	FINAL INSPECTION AND RA REPORTS.....	25
<b>6.0</b>	<b>PROJECT SCHEDULE.....</b>	<b>26</b>
<b>7.0</b>	<b>REFERENCES.....</b>	<b>27</b>

## **List of Figures**

Figure 1-1	Site Location Map
Figure 1-2	Site Features
Figure 1-3	Phase I Grid Excavations and Phase II EE/CA Soil Sampling Locations
Figure 2-1	Project Organizational Chart
Figure 3-1	Deliverable Schedule
Figure 4-1	Site Layout and Coordinate Grid System
Figure 6-1	Project Schedule

## **List of Appendices**

Appendix A	Statement of Work (SOW) and USEPA Letter Revisions to SOW
Appendix B	Performance Standard Verification Plan
Appendix C	Field Sampling and Analysis Plan
Appendix D	Quality Assurance Project Plan
Appendix E	Treatability Study Report
Appendix F	Erosion Control Plan
Appendix G	Community Relations Plan

Health and Safety Plan and Contingency Plan– Attachment under Separate Cover

---

## LIST OF ACRONYMS/ABBREVIATIONS

ARARs	Applicable or Relevant and Appropriate Requirements
AOC	Administrative Order by Consent
ASTM	American Standards for Testing Materials
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CQAPP	Construction Quality Assurance Project Plan
COC	Chain of Custody
CLP	Contract Laboratory Program
DQO	Data Quality Objective
EE/CA	Engineering Evaluation and Cost Analysis
ENTACT	ENTACT & Associates LLC
FINDS	Facility Index System
FSAP	Field Sampling and Analysis Plan
LDR	Land Disposal Restriction
mg/Kg	Milligrams /Kilogram
mg/L	Milligrams/Liter
MMI	Master Metals, Inc
NAAQS	National Ambient Air Quality Standard
NCP	National Contingency Plan
NEORSD	Northeast Ohio Regional Sewer District
O&M	Operation and Maintenance
OAC	Ohio Administrative Code
OEPA	Ohio Environmental Protection Agency
ORC	Ohio Revised Code
PCBs	Polychlorinated Biphenyls
ppm	Parts Per Million
PRP	Potentially Responsible Parties
QA/QC	Quality Assurance/ Quality Control
QAPP	Quality Assurance Project Plan
RBRG	Risk-Based Remediation Goal
RCRA	Resource Conservation and Recovery Act
RD/RA	Removal Design/ Removal Action
RPM	Remedial Project Manager
SACM	Superfund Accelerated Cleanup Model
SARA	Superfund Amendments and Reauthorization Act
SOP	Standard Operating Procedure
SOW	Statement of Work
SWMU	Solid Waste Management Unit
TAT	Technical Assistance Team
TCR	Time Critical Removal
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total Petroleum Hydrocarbon
TSP	Total Suspended Particulate
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
XRF	X-Ray Fluorescence

to control site access at the site in accordance with the design documents.

- Perform Operation and Maintenance activities to ensure the integrity of the remedy by maintaining and repairing the concrete and asphalt cover, and the perimeter fencing for a period of thirty (30) years, as required under CERCLA.

### **1.5 Highlights of Program**

The community relations program for the Site is designed to allow the community to learn about, and participate in, the Superfund process.

The community relations program will include the following activities:

- A spokesperson for the Site will be designated to answer questions and concerns the community may have about the implementation of the RA.
- A spokesperson from the EPA will be designated to answer questions and concerns the community may have about the implementation of the RA.
- An information repository has been established so that the community has access to documents written in accordance with the AOC.
- The community will have the opportunity to review the major documents written for the AOC.

### **1.6 Documents Available for Public Review**

Upon EPA approval of the final work plans and reports of findings required by the Consent Decree, the documents will be placed in a public location accessible to the community, i.e., public library. The workplan documents will be available for public review. A public notice will be published in the local newspaper to inform the community when documents require public notice or comment is required.

The documents that will be available for public review during the implementation of the RA are:

- The Removal Design/Removal Action Workplan
- The Field Sampling Plan
- The Quality Assurance Project Plan
- The Health and Safety Plan/Contingency Plan
- The Operation and Maintenance Plan
- The 1997 Treatability Study Report
- The Stormwater Control Plan
- The Pre-Design and Final Design Documents
- The Community Relations Plan

Reports that will be prepared and submitted during the course of this project include the following:

- Completion of Remedial Action Report
- Post-Excavation Confirmatory Soil Sampling Report
- Pre-final Inspection Report and Final Inspection Reports
- Monthly Reports during the implementation of the RA

## **1.7 Information Repositories**

The workplan and reports required for the RA are available for review in the site information repository at the following location:

Jefferson Branch  
Cleveland Public Library  
850 Jefferson Avenue  
Cleveland, Ohio  
Phone: (216) 623-7004

## **1.8 List of Contacts**

Questions or concerns related to the Remedial Design/Remedial Action Workplan being implemented at the Master Metals, Inc. Site in Cleveland, Ohio should be addressed to the following individuals:

Ms. Gwen Massenburg  
Remedial Project Manager  
U.S. Environmental Protection Agency  
Region V  
77 West Jackson Blvd.  
Chicago, Illinois 60604-3590  
Phone: (312) 886-0983  
Fax: (312) 886-4071  
Email: [masenburg.gwendolyn@epa.gov](mailto:masenburg.gwendolyn@epa.gov)

Ms. Sheila Abraham, PhD  
Ohio Environmental Protection Agency  
2110 East Aurora Rd.  
Twinsburg, Ohio 44087  
(330) 963-1290  
Fax: (330) 487-0769  
Email: [sheila.abraham@epa.state.oh.us](mailto:sheila.abraham@epa.state.oh.us)

Ms. Bri Bill  
Community Involvement Coordinator  
Office of Public Affairs  
U.S. Environmental Protection Agency  
Region V  
77 West Jackson Blvd. (P-19J)  
Chicago, Illinois 60604-3590  
Phone: (312) 353-6646  
Fax: (312) 353-1155  
Email: [bill.briana@epa.gov](mailto:bill.briana@epa.gov)